

To: James Cashwell From: Chris Ricardi Date: January 18, 2013

Subject: Interim Response Steps Work Plan Slurry Wall Monitoring Program 4Q12 –

November 2012

DATA VALIDATION REPORT
NOVEMBER 2012 SLURRY WALL GROUNDWATER, SURFACE WATER AND SEDIMENT
SAMPLES
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

TestAmerica Laboratories Data Sets: 480-28600, 480-28687, 480-28728, and 480-28730

1.0 INTRODUCTION

Groundwater, surface water, and sediment samples were collected from the Olin Chemical Superfund Site from November 13 to November 16, 2012. Samples were analyzed by TestAmerica Laboratories in Buffalo, New York. Data were reported in sample delivery groups (SDGs) 480-28600-1, 480-28687-1, 480-28728-1, and 480-28730-1. A summary of samples included in this review is contained in Table 1. Samples reviewed in this report were analyzed for the following USEPA SW-846 (USEPA, 1996), USEPA wastewater (USEPA, 1993), or Standard Methods (APHA, 1995):

- Dissolved metals (aluminum and chromium) by USEPA Method 6010B in groundwater
- Dissolved and total metals (aluminum, chromium, and sodium) by USEPA Method 6010B in surface water
- Total metals (aluminum, chromium, and iron) By USEPA Method 6010B in sediment
- General chemistry analyses for ammonia by USEPA Method 350.1 (Lachat 10-107-06-1B), chloride and sulfate by USEPA Method 300, nitrate and nitrite by USEPA Method 353.2, and specific conductance by SM 2510B.

The Final Interim Response Steps Work Plan (MACTEC, 2007) and the MassDEP Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) [MassDEP, 2010] were used as references during the review. Analytical packages were reviewed using the Level 1 Data Quality Evaluation checklists that were developed for the Olin Wilmington monitoring tasks. Final sample results are presented on data summaries in Table 2. A summary of validation qualification actions is presented on Table 3 for results that were qualified. Validation reason codes are associated with final results that have been qualified as indicated in Table 3.

Data Validation Report - November 2012 Slurry Wall Groundwater, Surface Water and Sediment Samples Olin Chemical Superfund Site Wilmington, Massachusetts

2.0 METALS

Data were reviewed for the following parameters:

- Data Completeness
- * Holding Time
- * Blanks
- Laboratory Control Sample / Laboratory Control Sample Duplicate Analysis (LCS/LCSD)
 - Matrix Spike/Matrix Spike Duplicate Analysis (MS/MSD)
- Detection Limits
- Dissolved vs. Total Metals Comparison (surface water only)
- * indicates that criteria were met for this parameter

MS/MSD

SDG 480-28730-1

Sample OC-SD-SD5 was submitted for MS/MSD analysis. Percent recovery for aluminum (148) in the MS was above the QC limit of 125. The percent recovery for aluminum (-36) in the MSD was below the QC limit of 75. The relative percent difference (RPD) limit of 30 was exceeded for aluminum (44). Sample results for aluminum in SDG 480-28730-1 were qualified estimated (J).

3.0 GENERAL CHEMISTRY - Ammonia, Chloride, Sulfate, Nitrate, Nitrite, and Specific Conductance

Data were reviewed for the following parameters:

- Data Completeness
 - **Holding Time**
- * Blanks
- * Matrix Spike Analysis
- Laboratory Duplicate Analysis (specific conductance only)
- Laboratory Control Sample/Laboratory Control Sample Duplicate Analysis
 Detection Limits
- * indicates that criteria were met for this parameter



Data Validation Report - November 2012 Slurry Wall Groundwater, Surface Water and Sediment Samples Olin Chemical Superfund Site Wilmington, Massachusetts

Holding Time

SDG 480-28728-1

The nitrate/nitrite technical holding time of 48 hours was grossly exceeded (5 days) in all samples. The sample results for nitrite were reported as not detected and were rejected (R) due to nitrite being converted to nitrate over time resulting in possible erroneous results of not detected in the samples. Nitrate results were qualified estimated (J) due to the possible high bias resulting from the conversion of nitrite to nitrate.

Detection Limits

SDG 480-28728-1

Nitrite quantitation limits were reported at 0.05 mg/L, above the project goal of 0.01 mg/L.

Unless discussed above, sample results are interpreted to be usable as reported by TestAmerica.

Chris Ricards	4/18/2013
Chris Ricardi, NRCC-EAC	Date
Senior Chemist	
My Muspy	4/18/2013
Michael Murphy	Date
Project Principal	

References:

American Public Health Association (APHA), 1995. "Standard Methods for Examination of Water and Wastewater"; 19th Edition; APHA, 1015 Fifteenth St., NW. Washington, DC 20005.

MACTEC, 2007. "Final Interim Response Steps Work Plan"; Olin Chemical Superfund Site; 51 Eames Street, Wilmington, Massachusetts; August 8, 2007.

Massachusetts Department of Environmental Protection (MassDEP), 2010. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; July 2010.



Data Validation Report - November 2012 Slurry Wall Groundwater, Surface Water and Sediment Samples Olin Chemical Superfund Site Wilmington, Massachusetts

- U.S. Environmental Protection Agency (USEPA), 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).
- U.S. Environmental Protection Agency (USEPA), 1996. "Test Methods for Evaluating Solid Waste"; Laboratory Manual Physical/Chemical Methods; Office of Solid Waste and Emergency Response; Washington, DC; SW-846; November 1986; Revision 4 December 1996.

Table 1 Sample Summary Data Validation Report

November 2012 Slurry Wall / Cap Groundwater, Surface Water, and Sediment Olin Chemical Superfund Site Wilmington, Massachusetts

				SW846	SW846	E350.1				
				6010B	6010B	(QuickChem		40CFR136A		
Lab Sample ID	Location	Sample ID	Sample Date	Total Metals	Filtered Metals	10-107-06-1-B) Ammonia	A2510B Conductance	300.0 Anions	E353.2	E160.3 Percent Solid
Groundwater	Location	Sample ID	Sample Date	IVICIAIS	Wetais	Allillollia	Conductance	Allions	Mili ale/Mili ile	Percent Solid
480-28600-1	GW-202S	OC-GW-202S	11/13/2012		2	1	1	2		
480-28600-2	GW-202D	OC-GW-202D	11/13/2012		2	1	1	2		
480-28600-3	GW-25	OC-GW-25	11/14/2012		2	1	1	2		
480-28600-4	GW-78S	OC-GW-78S	11/13/2012		2	1	1	2		
480-28600-5	GW-79S	OC-GW-79S	11/14/2012		2	1	1	2		
480-28600-6	PZ-16RR	OC-PZ-16RR	11/14/2012		2	1	1	2		
480-28600-7	PZ-17RR	OC-PZ-17RR	11/14/2012		2	1	1	2		
480-28600-8	PZ-18R	OC-PZ-18R	11/14/2012		2	1	1	2		
480-28600-9	GW-202D	OC-DUP-202D	11/13/2012		2	1	1	2		
480-28600-10	PZ-24	OC-PZ-24	11/13/2012		2	1	1	2		
480-28600-11	PZ-25	OC-PZ-25	11/13/2012		2	1	1	2		
480-28600-12	GW-10S	OC-GW-10S	11/14/2012		2	1	1	2		
480-28600-13	GW-76S	OC-GW-76S	11/14/2012		2	1	1	2		
480-28600-14	GW-24	OC-GW-24	11/14/2012		2	1	1	2		
480-28687-1	GW-201S	OC-GW-201S	11/15/2012		2	1	1	2		
480-28687-2	GW-34D	OC-GW-34D	11/15/2012		2	1	1	2		
480-28687-3	GW-34SR	OC-GW-34SR	11/15/2012		2	1	1	2		
480-28687-4	GW-35S	OC-GW-35S	11/15/2012		2	1	1	2		
480-28687-5	GW-43SR	OC-GW-43SR	11/15/2012		2	1	1	2		
480-28687-6	GW-CA1	OC-GW-CA1	11/15/2012		2	1	1	2		
Surface Water										
480-28728-1	ISCO1	OC-SW-ISCO1	11/16/2012	3	3	1	1	2	2	
480-28728-2	ISCO2	OC-SW-ISCO2	11/16/2012	3	3	1	1	2	2	
480-28728-3	ISCO3	OC-SW-ISCO3	11/16/2012	3	3	1	1	2	2	
480-28728-4	PZ-16RR	OC-SW-PZ-16RRSW	11/16/2012	3	3	1	1	2	2	
480-28728-5	PZ-17RR	OC-SW-PZ-17RRSW	11/16/2012	3	3	1	1	2	2	
480-28728-6	PZ-18R	OC-SW-PZ-18RSW	11/16/2012	3	3	1	1	2	2	
480-28728-7	SD-17	OC-SW-SD-17	11/16/2012	3	3	1	1	2	2	
480-28728-8	SD-17	OC-SW-SD-17-DUP	11/16/2012	3	3	1	1	2	2	
Sediment										
480-28730-1	SD-SD1	OC-SD-SD1	11/16/2012	3						2
480-28730-2	SD-SD2	OC-SD-SD2	11/16/2012	3						2
480-28730-3	SD-SD3	OC-SD-SD3	11/16/2012	3						2
480-28730-4	SD-SD4	OC-SD-SD4	11/16/2012	3						2
480-28730-5	SD-SD5	OC-SD-SD5	11/16/2012	3						2
480-28730-6	SD-SD5	OC-SD-SD5-DUP	11/16/2012	3						2

Notes:

Number listed under method indicates number of target analytes reported.

Prepared by / Date: KJC 12/07/12 Checked by / Date: MJW 12/12/12

Final Results Summary Data Validation Report

November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment

Olin Chemical Superfund Site Wilmington, Massachusetts

			Loc Name	GW-	10S	GW-2	01S	GW-2	202D	GW-2	202D	GW-2	202S	GW	/-24	GW	/-25
		Fie	eld Sample ID	OC-GV	V-10S	OC-GW	-201S	OC-DUI	P-202D	OC-GW-202D		OC-GW-202S		OC-GW-24		OC-GW-25	
		Field	Sample Date	11/14/12		11/15	5/12	11/1:	3/12	11/13	3/12	11/1:	3/12	11/1	4/12	11/1	4/12
	QC Code			FS	FS		6	FI	D	FS		FS		FS		F	S
	Lab Sample Delivery Group		480-28	600-1	480-28	687-1	480-28	600-1	480-28	600-1	480-28	8600-1	480-28600-1		480-28600-1		
Frac	Method	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
F	SW6010	Aluminum	mg/l	5.1		0.2 (IJ	3.2		3.2		0.2	U	0.2	U	0.2	U
F	SW6010	Chromium	mg/l	0.002	J	0.041		0.36		0.36		0.0037	J	0.005	U	0.0022	J
N	E300	Chloride	mg/l	29		120		180	180		170		83			140	
N	E300	Sulfate mg/l		87		1400		880	880			220		43		66	
N	E350.1	Nitrogen, as Ammonia	mg/l	1.5		140		120		140		40		26		35	
N	A2510B	LAB SPECIFIC CONDUCTANCE umhos/cm		320		3800		2400		2400		950		400		770	

Notes:

N = normal

F = filtered

FS = field sample

FD = field duplicate

U = not detected, value is the detection limit

J = value is estimated

mg/l = milligram per liter

Final Results Summary Data Validation Report

November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment

Olin Chemical Superfund Site

Wilmington, Massachusetts

			Loc Name	GW-3	34D	GW-34SR		GW	GW-35S		I3SR	GW-76S		GW-78S		GW-	-79S
		Fie	eld Sample ID	OC-GW	V-34D	OC-GW	/-34SR	OC-GW-35S		OC-GW-43SR		OC-GW-76S		OC-GW-78S		OC-G\	W-79S
		Field	Sample Date	11/15/12		11/15/12		11/1	5/12	11/15/12		11/14/12		11/13/12		11/1	4/12
	QC Code			FS		FS	3	F	S	FS		FS		FS		F	s
	Lab Sample Delivery Group		480-28	687-1	480-28	687-1	480-2	8687-1	480-28	687-1	480-28600-1		480-28600-1		480-28600-1		
Frac	Method	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
F	SW6010	Aluminum	mg/l	0.2 \	U	0.2	U	0.2	U	0.081	J	0.2	U	0.2	U	0.2	U
F	SW6010	Chromium	mg/l	0.017		0.0017	J	0.029		0.005	U	0.0016	J	0.0035	J	0.014	
N	E300	Chloride	mg/l	12		1.6		4.6		150		49		28		180	
N	E300	Sulfate	mg/l	28		8.9		96		30		22		540		860	
N	E350.1	Nitrogen, as Ammonia mg/l		12		0.012 J		14	14			9.4		49		120	
N	A2510B	LAB SPECIFIC CONDUCTANCE umhos/cm		200		70		490		610		265		1500		2500	

Notes:

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J = value is estimated

mg/l = milligram per liter

Final Results Summary Data Validation Report

November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment

Olin Chemical Superfund Site Wilmington, Massachusetts

			Loc Name	GW-	CA1	PZ-1	6RR	PZ-1	7RR	PZ-1	8R	PZ-	24	PZ-	25
		Fi	eld Sample ID	OC-GV	V-CA1	OC-PZ	-16RR	OC-PZ	-17RR	OC-PZ	'-18R	OC-P	Z-24	OC-P	Z-25
	Field Sample Date		11/15/12		11/1	11/14/12		4/12	11/14/12		11/13/12		11/1:	3/12	
	QC Code		F:	FS		S	F	S	FS	3	FS	3	FS	3	
		Lab Sample D	elivery Group	480-28	8687-1	480-28	8600-1	480-28	600-1	480-28	600-1	480-28	600-1	480-28	600-1
Frac	Method	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
F	SW6010	Aluminum	mg/l	0.2	U	0.2	U	0.19	J	0.2	U	0.2	J	0.2	U
F	SW6010	Chromium	mg/l	0.015		0.0029	J	0.098		0.0094		0.021		0.0091	
N	E300	Chloride	mg/l	13		190		92		110		18		19	
N	E300	Sulfate	mg/l	85		670		420		29		680		460	
N	E350.1	Nitrogen, as Ammonia	mg/l	1.3		110		43		21		47		38	
N	A2510B	LAB SPECIFIC CONDUCTANCE	umhos/cm	560		2400		1400		620		1800		1300	

Prepared by / Date:

Checked by / Date:

KJC 12/12/12

MJW 12/13/12

Notes:

N = normal

F = filtered

FS = field sample

FD = field duplicate

U = not detected, value is the detection limit

J = value is estimated

mg/l = milligram per liter

Table 2 Final Results Summary

Data Validation Report

November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment

Olin Chemical Superfund Site Wilmington, Massachusetts

			Loc Name	ISCO1	ISCO2	ISCO3	PZ-16RR	PZ-17RR	PZ-18R	SD-17	SD-17
		F	ield Sample ID	OC-SW-ISCO1	OC-SW-ISCO2	OC-SW-ISCO3	OC-SW-PZ-16RRSW	OC-SW-PZ-17RRSW	OC-SW-PZ-18RSW	OC-SW-SD-17	OC-SW-SD-17-DUP
		Fiel	d Sample Date	11/16/12	11/16/12	11/16/12	11/16/12	11/16/12	11/16/12	11/16/12	11/16/12
			QC Code	FS	FS	FS	FS	FS	FS	FS	FD
		Lab Sample I	Delivery Group	480-28728-1	480-28728-1	480-28728-1	480-28728-1	480-28728-1	480-28728-1	480-28728-1	480-28728-1
Frac	Method	Analyte	Units	Result Qual	Result Qual	Result Qual	Result Qual	Result Qual	Result Qual	Result Qual	Result Qual
Т	SW6010	Aluminum	mg/l	0.2	0.55	0.14 J	2.3	3.8	0.21	3.4	3.4
Т	SW6010	Chromium	mg/l	0.019	0.074	0.005 U	0.53	0.92	0.02	0.84	0.86
Т	SW6010	Sodium	mg/l	76	120	78	130	140	78	130	140
F	SW6010	Aluminum	mg/l	0.17 J	0.14 J	0.2 U	1.1	0.93	0.12 J	0.95	0.98
F	SW6010	Chromium	mg/l	0.017	0.031	0.005 U	0.3	0.36	0.015	0.36	0.36
F	SW6010	Sodium	mg/l	81	120	78	130	140	79	140	140
N	E300	Chloride	mg/l	110	140	150	140	160	110	170	170
N	A2510B	LAB SPECIFIC CONDUCTANCE	E umhos/cm	720	1,300	680	1,400	1,400	730	1,500	1,500
N	E353.2	Nitrate as N	mg/l	0.34 J	2 J	1 J	1.3 J	0.69 J	0.35 J	0.6 J	0.61 J
N	E353.2	Nitrite as N	mg/l	R	R	R	R	R	R	R	R
N	E350.1	Nitrogen, as Ammonia	mg/l	23	50	1.1	52	58	24	61	60
N	E300	Sulfate	mg/l	110	330	29	320	350	110	350	350

Prepared by / Date:

Checked by / Date:

KJC 12/12/12

MJW 12/13/12

Notes: N = normal

T = total (unfiltered)

i = totai (ariiliterea

F = filtered

FS = field sample

FD = field duplicate

U = not detected, value is the detection limit

J = value is estimated

R = value is rejected

mg/l = milligram per liter

Final Results Summary Data Validation Report

November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment

Olin Chemical Superfund Site Wilmington, Massachusetts

			Loc Name	SD-S	D1	SD-S	SD2	SD-S	D3	SD-S	D4	SD-S	D5	SD-S	D5
			Field Sample ID	OC-SD-	-SD1	OC-SD	-SD2	OC-SD	-SD3	OC-SD	-SD4	OC-SD-	-SD5	OC-SD-SI	D5-DUP
			Field Sample Date	11/16	/12	11/16	6/12	11/16	/12	11/16	/12	11/16	/12	11/16	5/12
			QC Code	FS	;	FS	3	FS	;	FS	3	FS		FC)
			Lab Sample Delivery Group	480-287	730-1	480-28	730-1	480-287	730-1	480-28	730-1	480-287	730-1	480-28	730-1
Frac	Method	Analyte	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Т	SW6010	Aluminum	mg/kg	7,100 J	l	5,100 、	J	6,600 J	J	7,700 、	J	11,000 J		9,800 .	J
Т	SW6010	Chromium	mg/kg	67		430		41		24		460		450	
Т	SW6010	Iron	mg/kg	9,000		6,200		9,600		9,900		14,000		11,000	
N	E160.3	Percent Moisture	percent	26		21		24		34		34		39	
N	E160.3	Percent Solids	percent	74		79		76		66		66		61	

Prepared by / Date:

Checked by / Date:

KJC 12/12/12

MJW 12/13/12

Notes:

N = normal

T = total (unfiltered)

FS = field sample

TB = trip blank

J = value is estimated

mg/kg = milligram per kilogram

Validation Qualification Action Summary

Data Validation Report

November 2012 Slurry Wall / Cap Groundwater, Surface Water and Sediment Olin Chemical Superfund Site

Wilmington, Massachusetts

		Analytical				Lab	Lab	Final	Final		
SDG	Lab Sample ID	Method	Fraction	Field Sample ID	Parameter	Result	Qualifier	Result	Qualifier	Val Reason Code	Units
480-28728-1	480-28728-1	E353.2	N	OC-SW-ISCO1	Nitrate as N	0.34	Н	0.34	J	HT-G	mg/l
480-28728-1	480-28728-1	E353.2	N	OC-SW-ISCO1	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-2	E353.2	N	OC-SW-ISCO2	Nitrate as N	2	Н	2	J	HT-G	mg/l
480-28728-1	480-28728-2	E353.2	N	OC-SW-ISCO2	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-3	E353.2	N	OC-SW-ISCO3	Nitrate as N	1	Н	1	J	HT-G	mg/l
480-28728-1	480-28728-3	E353.2	N	OC-SW-ISCO3	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-4	E353.2	N	OC-SW-PZ-16RRSW	Nitrate as N	1.3	Н	1.3	J	HT-G	mg/l
480-28728-1	480-28728-4	E353.2	N	OC-SW-PZ-16RRSW	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-5	E353.2	N	OC-SW-PZ-17RRSW	Nitrate as N	0.69	Н	0.69	J	HT-G	mg/l
480-28728-1	480-28728-5	E353.2	N	OC-SW-PZ-17RRSW	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-6	E353.2	N	OC-SW-PZ-18RSW	Nitrate as N	0.35	Н	0.35	J	HT-G	mg/l
480-28728-1	480-28728-6	E353.2	N	OC-SW-PZ-18RSW	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-7	E353.2	N	OC-SW-SD-17	Nitrate as N	0.6	Н	0.6	J	HT-G	mg/l
480-28728-1	480-28728-7	E353.2	N	OC-SW-SD-17	Nitrite as N	0.05	U H		R	HT-G	mg/l
480-28728-1	480-28728-8	E353.2	N	OC-SW-SD-17-DUP	Nitrate as N	0.61	Н	0.61	J	HT-G	mg/l
480-28728-1	480-28728-8	E353.2	N	OC-SW-SD-17-DUP	Nitrite as N	0.05	UH		R	HT-G	mg/l
480-28730-1	480-28730-1	SW6010	Т	OC-SD-SD1	Aluminum	7100		7100	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-2	SW6010	Т	OC-SD-SD2	Aluminum	5100		5100	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-3	SW6010	Т	OC-SD-SD3	Aluminum	6600		6600	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-4	SW6010	Т	OC-SD-SD4	Aluminum	7700		7700	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-5	SW6010	Т	OC-SD-SD5	Aluminum	11000		11000	J	MS-H, MS-L, MS-RPD	mg/kg
480-28730-1	480-28730-6	SW6010	Т	OC-SD-SD5-DUP	Aluminum	9800		9800	J	MS-H, MS-L, MS-RPD	mg/kg

Units:

mg/l = milligram per liter mg/kg = milligram per kilogram

Fraction

T = Total N = Normal Validation Qualifier:

J = Value is estimated R = Value is rejected

Validation Reason Codes:

HT-G = Holding time for prep or analysis grossly exceeded

MS-H = MS and/or MSD recovery high
MS-L = MS and/or MSD recovery low
MS-RPD = MS/MSD RPD limit exceeded

Prepared by / Date: KJC 12/12/12

Checked by / Date: MJW 12/13/12

Version 1.3, Oct 2011

OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST ICP METALS BY METHOD 6010B/200.7

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Sr. Review/Date Chus Ricards	ì	181	13
Lab Report # 480 -2860001			
Project # 61071200(6			

1.0	Laboratory Deliverable Requirements	
	1.1 Laboratory Information : Was all of the following provided in the laboratory report? Check items received.	Yes No No N/A Comments:
	☐ Name of Laboratory ☐ Address ☐ Project ID ☐ Phone #	☐ Sample identification – Field and Laboratory
	☐ Name of Laboratory ☐ Address ☐ Project ID ☐ Phone # Client Information: ☐ Name ☐ Address ☐ Client Cont	tact (IDs must be cross-referenced)
ACTIO	ON: If no, contact lab for submission of missing or illegible information.	
	1.2 Laboratory Report Certification Statement	Yes [1 No [] N/A [] Comments:
Does th	he laboratory report include a completed Analytical Report Certification in the required f	format?
ACTIO	N: If no, contact lab for submission of missing certification or certification with correct for	format.
	1.3 Laboratory Case Narrative:	Yes [No [N/A [] Comments:
	☐ Narrative serves as an exception report for the project and method QA/QC performs on the	rmance. Narrative includes an explanation of each discrepancy
		Certification Statement.
ACTIO	N: If no, contact lab for submission of missing or illegible information.	
	1.4 Chain of Custody (COC) copy present with all documentation completed	Yes No No N/A Comments:
	NOTE: Olin receives and maintains the original COC.	
ACTIO	ON : If no, contact lab for submission of copy of completed COC.	
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		1 of 10

	ot Information (Cooler Receipt Form present?): Collowing tasks completed and recorded upon receipt of the sample(s)	Yes 🗹	No []	N/A []	Comments:
Sample temperature confirmation	rmed: must be $1^{\circ} - 10^{\circ}$ C. (If samples were sent by courier and delivered	on the same	day as colle	ction, tempera	ture requirement does not apply).
☐ Container type noted ☐ sa	ample condition observed D pH verified (where applicable) D Field an	nd lab IDs cro	oss referenc	ed	
ACTION: If no, contact lab	for submission of missing or incomplete documentation.				
1.5.1 Were	e all samples delivered to the laboratory without breakage?	Yes 📝	No []	N/A []	Comments:
with	es the <i>Cooler Receipt Form</i> or Lab Narrative indicate other problems a sample receipt, condition of the samples, analytical problems or special amstances affecting the quality of the data?	Yes []	No 🗹	N/A []	Comments:
1.6 Sample Resul laboratory report	Its Section: Was each of the following requirements supplied in the ort for each sample?	Yes 🗹	No []	N/A []	Comments:
Field ID and Lab ID Clean-up method Matrix	☐ Analysis method ☐ Preparation method		oreparation/		moisture or solids
ACTION: If no, contact lab	o for submission of missing or incomplete information.				
	rmation: Was each of the following information supplied in the or each sample batch?	Yes 🗹	No []	N/A []	Comments:

☑ Met	hod blank	results 🖺 LCS recover	ries MS/MSD recoveries and RPDs Laborato	ory duplicate results (where applicable)	
ACTIO	N: If no,	, contact lab for submission	n of missing or incomplete information.		
2.0	Holdin	g Times			
Have a		ed? Holding time for meta	nined from date of collection to date of analysis, bee als is 180 days from sample collection to analysis for bot		Comments:
NOTE:	: List sam	ples that exceed hold time	with # of days exceeded on checklist		
ACTIC			exceeded, qualify all positive results (J) and non-detection time) reject (R) all non-detect results.	ts	
3.0	Labor	atory Method			
	3.1	Was the correct labora	atory method used?	Yes No No N/A	Comments:
		Water Digestion Soil Digestion Metals	3005A or 3010A or 3020A 3050B 6010B or 200.7		
comp	pared to		ory to provide justification for method chang Contact senior chemist to inform Client of chang		
	3.2	Are the practical quan □ SOW □ QA	ntitation limits the same as those specified by the PP □ Lab □ MADEP	ne Yes No No N/A	Comments:
NOT	E: Verify	that the reported metals m	natch the target list specified on the COC.		
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	If no, evaluate variation with respect to sample matrix, preparation, dilution, etc. If sample PQL is indeterminate, contact lab for explanation.				
3.3	Are results present for each sample in the SDG?	Yes 🔛	No [_]	N/A []	Comments:
ACTION: If 1	no, check Request for Analysis to verify if method was ordered and COC to verify that it	t was sent, an	d contact la	b for resubmis	ssion of the missing data
3.4	If dilutions were required, were dilution factors reported?	Yes 🗹	No [_]	N/A []	Comments:
ACTION: If 1	no, contact the lab for submission.				
4.0 <u>Met</u>	hod Blanks				
4.1	Is the Method Blank Summary present?	Yes 🗹	No []	N/A []	Comments:
ACTION:	If no, call the laboratory for submission of missing data.				
4.2	Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples?	Yes 🗹	No []	N/A []	Comments:
	If no, contact laboratory for justification. Consult senior chemist for action arrate non-compliance.				
4.3	Is the method blank less than the PQLs for all target elements?	Yes [\(\)	No[]	N/A []	Comments:
NOTE: M. samples	ADEP requires the method blank to be matrix matched and digested with the	240		- ;	
4.4 the fo	Do any method blanks have positive results for metals? Qualify data according to bllowing:	Yes [_]	No 🗹	N/A [_]	Comments:

		sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the or the concentration reported if greater than the PQL.				
	If the s	sample concentration is $> 5 \times$ blank value, no qualification is needed.				
		or any blank with positive results, list all contaminants for each method blank value) and the associated samples and qualifiers.	k including	the concen	tration detec	eted and the flagging level (flagging level
5.0	Labor	ratory Control Standard				
	5.1	Was a laboratory control standard run with each analytical batch of 20 samples or less?	Yes 🗹	No []	N/A []	Comments:
AC'	TION:	tall target, second source LCS is required by MADEP. Call laboratory for LCS form submittal. If data are not available, use judgement to evaluate data accuracy associated with that batch.				
	5.2	Is a LCS Summary Form present?	Yes 🗹	No [_]	N/A []	Comments:
AC'	TION:	If no, contact lab for resubmission of missing data.				•
. CI	Water Soil	within Lab generated limits	Yes [_]	No 🗹	N/A [_]	Comments:
with non	nin the b -detects	If recovery is above the upper limit, qualify all positive sample results patch as (J). If recovery is below the lower limit, qualify all positive and results within the batch as (J). If LCS recovery is <30%, positive and non-as are rejected (R).				

Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

were Yes [No [] N/A [] Commer

Were project-specific MS/MSDs collected? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes Mo No N/A Comments:

06-64-2020

NOTE: A full target, second source MS/MSD is required by MADEP.

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes No N/A Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

	/			
Yes [No [V	N/A	1	Comments

	MADEP	QAPP	
Sample Type	% Rec	% Rec	Method
Water	75-125	N/A	6010B
Water	N/A	70-130	200.7
Soil	75-125	75-125	6010B

NOTE:
$$%R = (SSR-SR) \times 100\%$$

Where:
$$SSR = Spiked sample result$$

 $SR = Sample result$

$$SA = Spike added$$

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.			
ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).			
6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits?	Yes []	No N/A	_] Comments:
NOTE: RPD = S-D x 100% Where: $S = MS$ sample result $D = MSD$ sample result			
NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.			
ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).			
7.0 <u>Laboratory Duplicate</u>			
7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present?	Yes []	No N/A	_] Comments:
NOTE: MADEP refers to this sample as a "matrix duplicate".			
ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.			
7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits?	Yes []	No [N/A [Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD	
For aqueous results > $5 \times$ RL, RPD must be $\pm 20\%$	20	
For aqueous results < 5× RL, RPD must be ≤ RL	20	
For soil/sediment results > $5 \times$ RL, RPD must be $\pm 35\%$	20	
For soil/sediment results $< 5 \times RL$, RPD must be $< 2 \times RL$	20	

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.	Yes [No [🗸	N/A []	Comments:
8.2 Do any rinsate blanks have positive results?	Yes[]	No []	N/A [Comments:
NOTE: MADEP does not require the collection of rinsate blanks.				
ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.				
If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.				
If the sample concentration is $> 5 \times$ blank value, no qualification is needed.				

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated Yes No No NA Comments field duplicates.

9.2 Were field duplicates collected per the required frequency?	Yes 🗹	No []	N/A [_]	Comments:
SOW ☐ QAPP (1 per 10) ☐ MADEP Option 1 (1 per 20) ☐ MADEP Option 3 (1 per 10) ☐				
9.3 Was the RPD \leq 50% for soils or waters? Calculate the RPD for all results and attach to this review.	Yes 🗹	No [_]	N/A []	Comments:
ACTION : RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if	the RPD e	xceeds 50%	⁄0.	
10.0 Special QA/QC				
10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal.	Yes []	No 🗸	N/A []	Comments:
ACTION: If results for both total and dissolved are $\geq 5x$ the PQL and the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than $5x$ the PQL and the difference exceeds $2x$ the PQL, flag both results as estimated (J)				

10.0	Application of Validation Qualifiers
	Was any of the data qualified? Yes \[\] No \[\sqrt{N/A} \[\] Comments:
If so, ap	oply data qualifiers directly to the DQE copy of laboratory report and flag pages for entry in database.
REFE	RENCES
LAW,	1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmenta Services, Kennesaw, GA 30144. August 1999
U.S. E	Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses" Hazardous Site Evaluation Division; February 1989.
MADI	EP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.
MADI	EP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM Section VIIA, Final, Revision No. 1, 1 July 2010.
MADI	EP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

Version 1.3, Oct 2011

OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST ICP METALS BY METHOD 6010B/200.7

Reviewer/Date Mike Was Hosur	12	1/12	-/1:	ک
Sr. Review/Date Chus Ricard	1	12	13	
Lab Report # 410-28687-1				
Project # 610712001 &		,		

1.0	Laboratory Deliverable Requirements
	1.1 Laboratory Information: Was all of the following provided in the laboratory report? Yes \(\subseteq \) No \(\subseteq \) No \(\subseteq \) No \(\subseteq \) Comments: Check items received.
	☐ Name of Laboratory ☐ Address ☐ Project ID ☐ Phone # ☐ Sample identification – Field and Laboratory
	Client Information: ☐ Name ☐ Address ☐ Client Contact (IDs must be cross-referenced)
ACTIO	ON: If no, contact lab for submission of missing or illegible information.
	1.2 Laboratory Report Certification Statement Yes [No [N/A [] Comments:
Does th	he laboratory report include a completed Analytical Report Certification in the required format?
ACTIO	N: If no, contact lab for submission of missing certification or certification with correct format.
	1.3 Laboratory Case Narrative: Yes [No [] N/A [] Comments:
	Narrative serves as an exception report for the project and method QA/QC performance. Narrative includes an explanation of each discrepancy on the
	Certification Statement.
ACTIO	N: If no, contact lab for submission of missing or illegible information.
	1.4 Chain of Custody (COC) copy present with all documentation completed Yes No NA Comments:
	NOTE: Olin receives and maintains the <i>original COC</i> .
ACTIO	N: If no, contact lab for submission of copy of completed COC.
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	1 of 10

1.5 S	Sample R	eceipt Information (Cooler Receipt Form present?):	Yes 🗹	No []	N/A []	Comments:
	each of he laborat	the following tasks completed and recorded upon receipt of the sample(s) tory?				
☑ Sample tem	perature o	confirmed: must be $1^{\circ} - 10^{\circ}$ C. (If samples were sent by courier and delivered	on the same	day as colle	ection, tempera	ature requirement does not apply).
		☐ sample condition observed ☐ pH verified (where applicable) ☐ Field a				
ACTION: If 1	no, contac	et lab for submission of missing or incomplete documentation.				
	1.5.1	Were all samples delivered to the laboratory without breakage?	Yes 🗹	No []	N/A []	Comments:
	1.5.2	Does the <i>Cooler Receipt Form</i> or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?	Yes []	No 🗹	N/A []	Comments:
1.6 s	Sample I aboratory	Results Section: Was each of the following requirements supplied in the report for each sample?	Yes 🖳	No [_]	N/A []	Comments:
☐ Field ID a ☐ Clean-up n ☐ Matrix	nd Lab II nethod	D	☐ Dilution ☐ Date of µ its (soils mus	Factor preparation/ t be reported	% % % % % % % % % % % % % % % % % % %	moisture or solids Preporting limit estion clean-up and analysis, where applicable t)
ACTION: If	no, conta	ct lab for submission of missing or incomplete information.				
1.7 (labora	QA/QC latory repo	Information: Was each of the following information supplied in the ort for each sample batch?	Yes 🗹	No []	N/A []	Comments:

	/						
☑ Method b	olank results LCS recove	eries MS/MSD recoveries and RP.	Ds Laboratory	duplicate res	sults (where	applicable)	
ACTION: I	f no, contact lab for submission	on of missing or incomplete information	L.				
2.0 <u>Hol</u>	ding Times						
exce	eeded? Holding time for meta	mined from date of collection to date als is 180 days from sample collection t		Yes [_]	No 🗹	N/A]	Comments:
	er and soil.						
NOTE: List	samples that exceed hold time	e with # of days exceeded on checklist					
		exceeded, qualify all positive results (lding time) reject (R) all non-detect resu					
3.0 <u>La</u> l	boratory Method						
3.1	Was the correct labora	atory method used?	·	Yes 🗹	No []	N/A []	Comments:
	Water Digestion	3005A or 3010A or 3020A					
	Soil Digestion	3050B					
	Metals	6010B or 200.7					
compared		ory to provide justification for Contact senior chemist to inform	~				
3.2	Are the practical qua	ntitation limits the same as those APP □ Lab □ MADEP	specified by the	Yes 🔟	No []	N/A []	Comments:
NOTE: Ve	erify that the reported metals r	natch the target list specified on the CO	OC.				
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		If no, evaluate variation with respect to sample matrix, preparation, dilution, c. If sample PQL is indeterminate, contact lab for explanation.				
	3.3	Are results present for each sample in the SDG?	Yes 🗾	No []	N/A []	Comments:
ACTIC	N: If no	o, check Request for Analysis to verify if method was ordered and COC to verify that it	was sent, an	d contact la	b for resubmis	ssion of the missing data
	3.4	If dilutions were required, were dilution factors reported?	Yes 🗹	No []	N/A []	Comments:
ACTIC	N: If no	o, contact the lab for submission.				
4.0	Meth	od Blanks				
	4.1	Is the Method Blank Summary present?	Yes 🗹	No []	N/A [_]	Comments:
ACT	ION:	If no, call the laboratory for submission of missing data.				
	4.2	Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples?	Yes 🗹	No []	N/A []	Comments:
ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.						
	4.3	Is the method blank less than the PQLs for all target elements?	Yes [🗸	No[]	N/A []	Comments:
NOT samp		DEP requires the method blank to be matrix matched and digested with the				
		Do any method blanks have positive results for metals? Qualify data according to lowing:	Yes [_]	No 🗹	N/A []	Comments:

If the sample co	oncentration is < 5	5 × blank value,	flag sample r	esult non-detect '	"U"	at the
PQL or the con-	centration reporte	ed if greater than	1 the PQL.			

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

– JX u	ic Dialik	value) and the associated samples and quantiers.				
5.0	Labo	ratory Control Standard				
	5.1	Was a laboratory control standard run with each analytical batch of 20 samples or less?	Yes 🗹	No []	N/A []	Comments:
AC	TON:	Ill target, second source LCS is required by MADEP. Call laboratory for LCS form submittal. If data are not available, use judgement to evaluate data accuracy associated with that batch.				
	5.2	Is a LCS Summary Form present?	Yes 📝	No []	N/A []	Comments:
AC	TION:	If no, contact lab for resubmission of missing data.				
	5.3 Sampi Water Soil	Is the recovery of any analyte outside of MADEP control limits? MADEP Le Type % Rec 80-120 within Lab generated limits	Yes []	No 🗹	N/A []	Comments:
with non-	TION: in the b detects	If recovery is above the upper limit, qualify all positive sample results eatch as (J). If recovery is below the lower limit, qualify all positive and results within the batch as (J). If LCS recovery is <30%, positive and nonsare rejected (R).				
						Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

Were project-specific MS/MSDs collected? List project samples that were spiked.

Yes No N/A Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes No No N/A Comments:

NOTE: A <u>full</u> target, second source MS/MSD is required by MADEP.

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes No N/A Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

Yes []	No []	N/A []	Comments:

	MADEP	QAPP	
Sample Type	% Rec	% Rec	Method
Water	<i>75-125</i>	N/A	6010B
Water	N/A	70-130	200.7
Soil	75-125	75-125	6010B

NOTE:
$$%R = (SSR-SR) \times 100\%$$

Where: SSR = Spiked sample result

SR = Sample result

SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.				
ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).				
6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits?	Yes []	No [N/A	Comments:
NOTE : RPD = S-D x 100% Where: S = MS sample result $(S+D)/2$ $D = MSD$ sample result				
NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.				
ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).				
7.0 <u>Laboratory Duplicate</u>				
7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present?	Yes	No 🗹	N/A []	Comments:
NOTE: MADEP refers to this sample as a "matrix duplicate".				
ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.				
7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits?	Yes [_]	No []	N/A 🗂	Comments:

	MADEP Laboratory Duplicate Sample RPD Criteria: QAPP RPD For aqueous results > $5 \times RL$, RPD must be $\pm 20\%$ 20 For aqueous results < $5 \times RL$, RPD must be $\leq RL$ 20 For soil/sediment results > $5 \times RL$, RPD must be $\pm 35\%$ 20 For soil/sediment results < $5 \times RL$, RPD must be $\leq 2 \times RL$ 20 FION: If the RPD exceeds the limits, qualify both positive results and non-detectimated and flag them J. Narrate non-compliance	cts			
8.0	Sampling Accuracy				
	ajority of ground water samples are collected directly from a tap, process stream, edicated tubing. Rinse blanks will not be collected.	or			
	8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list the associated samples from the senior chemist.	of Yes [No 🗂	N/A []	Comments:
	8.2 Do any rinsate blanks have positive results?	Yes [l Nofi	N/A [~]	Comments:
NOT	E: MADEP does not require the collection of rinsate blanks.	100 [1 110	17/21	Comments.
	TION: Evaluate rinsate results against blank results to determine if contaminate be laboratory-derived. If results are not lab-related, qualify according to below.	ant			
	If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.				
	If the sample concentration is $> 5 \times$ blank value, no qualification is needed.				
9.0	Field Duplicates				
	9.1 Were field duplicate samples collected? Obtain a list of samples and their associative field duplicates.	ted Yes []	No 📋	N/A [_]	Comments:

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9.2 Were field duplicates collected per the required frequency?	Yes [_]	No []	N/A	Comments:			
SOW ☐ QAPP (1 per 10) ☐ MADEP Option 1 (1 per 20) ☐ MADEP Option 3 (1 per 10) ☐							
9.3 Was the RPD \leq 50% for soils or waters? Calculate the RPD for all results and attach to this review.	Yes []	No []	N/A	Comments:			
ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.							
10.0 Special QA/QC							
10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal.	Yes []	No 🗹	N/A []	Comments:			
ACTION: If results for both total and dissolved are $\geq 5x$ the PQL and the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than $5x$ the PQL and the difference exceeds $2x$ the PQL, flag both results as estimated (J)							

10.0	Application of Validation Qualifiers								
	Was any of the data qualified?	Yes []	No 🗹	N/A []	Comments:				
If so, ap	If so, apply data qualifiers directly to the DQE copy of laboratory report and flag pages for entry in database.								
REFE	RENCES								
LAW,	1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 I Services, Kennesaw, GA 30144. August 1999	Eames Stre	et, Wilmin	igton, MA",	LAW Engineering and Environmenta				
U.S. E	nvironmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Hazardous Site Evaluation Division; February 1989.	ı Validation	a Function	al Guideline	s For Evaluating Inorganic Analyses"				
MADE	MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.								
MADE	ADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM Section VIIA, Final, Revision No. 1, 1 July 2010.								
MADE	P, 2010. "Quality Control Requirements and Performance Standards for the Ars. Spectrometry (ICP-AES) in Support of Response Actions under the Massachus 2010.	•			- ·				

Version 1.3, Oct 2011

OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST ICP METALS BY METHOD 6010B/200.7

Reviewer/Date	Mike WASHBUR	My 12	112	112
Sr. Review/Dat	e Chins Ricana	di	118	13
Lab Report #	480-28728			
Project #	6107120016			

1.0	<u>Laboratory Deliverable Requirements</u>						
	1.1 Laboratory Information : Was all of the following provided in the laboratory report? Check items received.	Yes No No N/A Comments:					
	☑ Name of Laboratory ☑ Address ☑ Project ID ☑ Phone #	☐ Sample identification – Field and Laboratory					
	☐ Name of Laboratory ☐ Address ☐ Project ID ☐ Phone # Client Information: ☐ Name ☐ Address ☐ Client Col.	ntact (IDs must be cross-referenced)					
ACTION: If no, contact lab for submission of missing or illegible information.							
	1.2 Laboratory Report Certification Statement	Yes [] No [] N/A [] Comments:					
Does t	he laboratory report include a completed Analytical Report Certification in the required	format?					
ACTIO	ON : If no, contact lab for submission of missing certification or certification with correct	format.					
	1.3 Laboratory Case Narrative:	Yes [] No [] N/A [] Comments:					
	Narrative serves as an exception report for the project and method QA/QC perform the	ormance. Narrative includes an explanation of each discrepancy					
		Certification Statement.					
ACTIO	ON : If no, contact lab for submission of missing or illegible information.						
	1.4 Chain of Custody (COC) copy present with all documentation completed	Yes No No N/A Comments:					
	NOTE: Olin receives and maintains the <i>original COC</i> .						
ACTIC	ON : If no, contact lab for submission of copy of completed <i>COC</i> .						
P:\Projec	cts\olinwilm\Data Validation\DV checklists\2011 Revisions\6010.doc						
		1 of 10					

-	Receipt Information (Cooler Receipt Form present?): If the following tasks completed and recorded upon receipt of the sample atory?		No [_]	N/A []	Comments:		
Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).							
Container type noted	d ☑ sample condition observed ☑ pH verified (where applicable) ☑ Fiel	d and lab IDs cr	ross referenc	ed			
ACTION: If no, conta	act lab for submission of missing or incomplete documentation.						
1.5.1	Were all samples delivered to the laboratory without breakage?	Yes 🗹	No []	N/A []	Comments:		
1.5.2	Does the <i>Cooler Receipt Form</i> or Lab Narrative indicate other problem with sample receipt, condition of the samples, analytical problems or specircumstances affecting the quality of the data?	ns ial Yes [_]	No 🗹	N/A []	Comments:		
1.6 Sample laborator	Results Section: Was each of the following requirements supplied in try report for each sample?	he Yes	No []	N/A []	Comments:		
☐ Field ID and Lab ☐ Clean-up method ☐ Matrix	ID	Dilution Date of Units (soils mus	preparation/	extraction/dige	moisture or solids		
ACTION: If no, cont	tact lab for submission of missing or incomplete information.						
1.7 QA/QC Information: Was each of the following information supplied in the Yes No NA Comments: laboratory report for each sample batch?							

☑ Method blank	results LCS recoveri	es MS/MSD recoveries and RPDs Laborate	ory duplicate results (where	e applicable)	
ACTION: If no,	contact lab for submission	of missing or incomplete information.			
			•		
2.0 Holding	g Times				
	d? Holding time for metal:	ined from date of collection to date of analysis, because is 180 days from sample collection to analysis for bo		N/A]	Comments:
NOTE: List samp	ples that exceed hold time v	with # of days exceeded on checklist			
		exceeded, qualify all positive results (J) and non-detecting time) reject (R) all non-detect results.	ts		
3.0 <u>Labora</u>	atory Method				
3.1	Was the correct laborat	ory method used?	Yes Mo No	N/A []	Comments:
	Water Digestion Soil Digestion Metals	3005A or 3010A or 3020A 3050B 6010B or 200.7			
	the requested method. C	ry to provide justification for method chang Contact senior chemist to inform Client of chang			
3.2	Are the practical quant ☐ SOW ☐ QAF	titation limits the same as those specified by the PP	ne Yes No	N/A []	Comments:
NOTE: Verify	that the reported metals ma	atch the target list specified on the COC.			
CO10 1					

ACTION : If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.						
3.3	Are results present for each sample in the SDG?	Yes 🗹	No []	N/A []	Comments:	
ACTION: If 1	no, check Request for Analysis to verify if method was ordered and COC to verify that it	t was sent, ar	d contact la	b for resubmi	ssion of the missing data	
3.4	If dilutions were required, were dilution factors reported?	Yes 🗹	No [_]	N/A [_]	Comments:	
ACTION: If 1	no, contact the lab for submission.					
4.0 <u>Met</u>	hod Blanks					
4.1	Is the Method Blank Summary present?	Yes 🗹	No []	N/A []	Comments:	
ACTION:	If no, call the laboratory for submission of missing data.					
4.2	Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples?	Yes 🗹	No []	N/A []	Comments:	
	If no, contact laboratory for justification. Consult senior chemist for action trate non-compliance.					
4.3	Is the method blank less than the PQLs for all target elements?	Yes [No[]	N/A []	Comments:	
NOTE: Ma samples	ADEP requires the method blank to be matrix matched and digested with the					
4.4 the fo	Do any method blanks have positive results for metals? Qualify data according to bllowing:	Yes []	No 🗹	N/A []	Comments:	

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the	he
PQL or the concentration reported if greater than the PQL.	

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0	Labor	ratory Control Standard				
	5.1	Was a laboratory control standard run with each analytical batch of 20 samples or less?	Yes 🗹	No []	N/A [_]	Comments:
ACT	ION:	Ill target, second source LCS is required by MADEP. Call laboratory for LCS form submittal. If data are not available, use judgement to evaluate data accuracy associated with that batch.				
	5.2	Is a LCS Summary Form present?	Yes 🗹	No []	N/A []	Comments:
ACT	ION: I	If no, contact lab for resubmission of missing data.				
within	Water Soil ION: In the b	Is the recovery of any analyte outside of MADEP control limits? MADEP e Type 80-120 within Lab generated limits If recovery is above the upper limit, qualify all positive sample results eatch as (J). If recovery is below the lower limit, qualify all positive and results within the batch as (J). If LCS recovery is <30%, positive and nonsare rejected (R).	Yes []	No 🗹	N/A []	Comments:
						Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-SW-SP-17

Were project-specific MS/MSDs collected? List project samples that were spiked.

Yes Mo No N/A Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [No [] N/A [] Comments:

NOTE: A <u>full</u> target, second source MS/MSD is required by MADEP.

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes [No [] N/A [] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

Yes [] No [N/A [] Comments:

	MADEP	QAPP	
Sample Type	% Rec	% Rec	Method
Water	75-125	N/A	6010B
Water	N/A	70-130	200.7
Soil	75-125	75-125	6010B

NOTE:
$$%R = (SSR-SR) \times 100\%$$

Where: SSR = Spiked sample result

SR = Sample result

SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.				
ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).				
6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits?	Yes []	No 🗹	N/A []	Comments:
NOTE: RPD = S-D x 100% Where: $S = MS$ sample result $D = MSD$ sample result				
NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.				
ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).				
7.0 <u>Laboratory Duplicate</u>				
7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present?	Yes	No 🗹	N/A []	Comments:
NOTE: MADEP refers to this sample as a "matrix duplicate".				
ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.				
7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits?	Yes [_]	No []	N/A	Comments:

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	MADEP Laboratory Duplicate Sample RPD Criteria: Q For aqueous results > $5 \times RL$, RPD must be $\pm 20\%$ For aqueous results < $5 \times RL$, RPD must be $\leq RL$ For soil/sediment results > $5 \times RL$, RPD must be $\pm 35\%$ For soil/sediment results < $5 \times RL$, RPD must be $\leq 2 \times RL$ TION: If the RPD exceeds the limits, qualify both positive restimated and flag them J. Narrate non-compliance	APP RPD 20 20 20 20 20 20 ults and non-detects				
8.0	Sampling Accuracy	•				
	ajority of ground water samples are collected directly from a tapedicated tubing. Rinse blanks will not be collected.	o, process stream, or				
	8.1 Were rinsate blanks collected? Prior to evaluating rinsate the associated samples from the senior chemist.	olanks, obtain a list of	Yes [_]	No [N/A []	Comments:
Non	8.2 Do any rinsate blanks have positive results?		Yes []	No []	N/A [Comments:
NOI	E: MADEP does not require the collection of rinsate blanks.					
	ION: Evaluate rinsate results against blank results to determ be laboratory-derived. If results are not lab-related, qualify according to the control of t					
	If the sample concentration is $< 5 \times$ blank value, flag sample result no PQL or the concentration reported if greater than the PQL.	on-detect "U" at the				
	If the sample concentration is $> 5 \times$ blank value, no qualification is no	eded.				
9.0	Field Duplicates					
	9.1 Were field duplicate samples collected? Obtain a list of sample field duplicates.	es and their associated	Yes 🚺	No []	N/A []	Comments:

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9.2 Were field duplicates collected per the required frequency?	Yes No No N/A Comments:
SOW □ QAPP (1 per 10) □ MADEP Option 1 (1 per 20) □ MADEP Option 3 (1 per 10) □	
9.3 Was the RPD \leq 50% for soils or waters? Calculate the RPD for all results and attach to this review.	Yes No No N/A Comments:
ACTION : RPD must be ≤50% for soil and water. Qualify data (J) for both sample results in	f the RPD exceeds 50%.
10.0 Special QA/QC	
10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal.	Yes No No No NA Comments:
ACTION: If results for both total and dissolved are $\geq 5x$ the PQL and the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than $5x$ the PQL and the difference exceeds $2x$ the PQL, flag both results as estimated (J)	Sodium dissolved exceeded total fraction
1 QL, hag both results as estimated (b)	
	but <10%. No action
	require,

10.0	Application of Validation Qualifiers				
	Was any of the data qualified?	Yes []	No 🗹	N/A []	Comments:
If so, ap	ply data qualifiers directly to the DQE copy of laboratory report and flag pages for entry in d	atabase.			

REFERENCES

- LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999
- U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

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Field Duplicate

fraction	lab_sample_id	field_sample_id	qc_code	param_name	final_result	Average	Difference	RPD
D	480-28728-7	OC-SW-SD-17	FS	Aluminum	0.95	0.965	0.03	3%
D	480-28728-8	OC-SW-SD-17-DUP	FD	Aluminum	0.98			
T	480-28728-7	OC-SW-SD-17	FS	Aluminum	3.4	3.4	0	0%
T	480-28728-8	OC-SW-SD-17-DUP	FD	Aluminum	3.4			
D	480-28728-7	OC-SW-SD-17	FS	Chromium	0.36	0.36	0	0%
D	480-28728-8	OC-SW-SD-17-DUP	FD	Chromium	0.36			
T	480-28728-7	OC-SW-SD-17	FS	Chromium	0.84	0.85	0.02	2%
T	480-28728-8	OC-SW-SD-17-DUP	FD	Chromium	0.86			
D	480-28728-7	OC-SW-SD-17	FS	Sodium	140	140	0	0%
D	480-28728-8	OC-SW-SD-17-DUP	FD	Sodium	140			
T	480-28728-7	OC-SW-SD-17	FS	Sodium	130	135	10	7%
T	480-28728-8	OC-SW-SD-17-DUP	FD	Sodium	140			

M2/12/12

Dissolve 2 Total camparison

fraction	lab_sample_id	field_sample_id	qc_code	param_name	final_result	QC Limit
D	480-28728-1	OC-SW-ISCO1	FS	Sodium	81	83.6
Τ	480-28728-1	OC-SW-ISCO1	FS	Sodium	76	
D	480-28728-6	OC-SW-PZ-18RSW	FS	Sodium	79	85.8
T	480-28728-6	OC-SW-PZ-18RSW	FS	Sodium	78	
D	480-28728-7	OC-SW-SD-17	FS	Sodium	140	143
Т	480-28728-7	OC-SW-SD-17	FS	Sodium	130	

m)~ 12/12/12

Version 1.3, Oct 2011

OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST ICP METALS BY METHOD 6010B/200.7

Reviewer/Date Mike WASHBURN	12/12/12
r. Review/Date Chrs Ricard	1/18/13
Lab Report # 480-28730	
Project # (0 107120011	

1.0	Laboratory Deliverable Requirements	
	1.1 Laboratory Information : Was all of the following provided in the laboratory report? Check items received.	Yes No No Comments:
	☐ Name of Laboratory ☐ Address ☐ Project ID ☐ Phone #	☐ Sample identification – Field and Laboratory
	☐ Name of Laboratory ☐ Address ☐ Project ID ☐ Phone # Client Information: ☐ Name ☐ Address ☐ Client Co	ontact (IDs must be cross-referenced)
ACTIC	DN : If no, contact lab for submission of missing or illegible information.	
	1.2 Laboratory Report Certification Statement	Yes [No [] N/A [] Comments:
Does th	ne laboratory report include a completed Analytical Report Certification in the required	l format?
ACTIO	N: If no, contact lab for submission of missing certification or certification with correct	t format.
	1.3 Laboratory Case Narrative:	Yes [No [] N/A [] Comments:
	Narrative serves as an exception report for the project and method QA/QC perion the	formance. Marrative includes an explanation of each discrepancy
		Certification Statement.
ACTIO	N: If no, contact lab for submission of missing or illegible information.	
	1.4 Chain of Custody (COC) copy present with all documentation completed	Yes No No N/A Comments:
	NOTE: Olin receives and maintains the <i>original COC</i> .	
ACTIO	N: If no, contact lab for submission of copy of completed COC.	
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		1 01 10

1.5 Sample	Receipt Information (Cooler Receipt Form present?):	Yes 🗹	No []	N/A []	Comments:
Were each of into the labor	of the following tasks completed and recorded upon receipt of the sample(s) ratory?				
Sample temperature	e confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered of	on the same	day as colle	ection, tempera	ature requirement does not apply).
☐ Container type note	ed ☑ sample condition observed ☑ pH verified (where applicable) ☑ Field an	d lab IDs cro	oss referenc	ed	
ACTION: If no, cont	tact lab for submission of missing or incomplete documentation.				
1.5.1	Were all samples delivered to the laboratory without breakage?	Yes 🗹	No []	N/A []	Comments:
1.5.2	Does the <i>Cooler Receipt Form</i> or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?	Yes [_]	No [N/A []	Comments:
1.6 Sample laborato	e Results Section: Was each of the following requirements supplied in the bry report for each sample?	Yes [No []	N/A []	Comments:
Field ID and Lab Clean-up method Matrix	Did Date and time collected Analyst Initials Analysis method Target analytes and concentrations	☐ Dilution☐ Date of pts (soils must	Factor preparation/ t be reporte	/extraction/diged in dry weigh	moisture or solids
ACTION: If no, con	stact lab for submission of missing or incomplete information.				
1.7 QA/QC laboratory re	Information: Was each of the following information supplied in the port for each sample batch?	Yes 🗹	No [_]	N/A []	Comments:

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Met.	hod blank	results LCS 1	recoverie	s MS/MSD recoveries and	RPDs A Laboratory	duplicate res	ults (where	applicable)		
ACTIO	N: If no,	contact lab for sub-	mission o	of missing or incomplete informati	ion.					
2.0	Holding	<u>g Times</u>								
Have a	-	d? Holding time fo		ed from date of collection to d is 180 days from sample collection		Yes []	No 🗹	N/A]	Comments:	
NOTE:	: List samp	oles that exceed hol	ld time w	ith # of days exceeded on checklis	st					
ACTIC				ceeded, qualify all positive resuling time) reject (R) all non-detect						
3.0	Labora	ntory Method								
	3.1	Was the correct	laborato	ry method used?		Yes [No []	N/A []	Comments:	
		Water Digestion Soil Digestion Metals	ı	3005A or 3010A or 3020A 3050B 6010B or 200.7						
comp	pared to	the requested met variance.	ethod. Co	y to provide justification for ontact senior chemist to infor-	m Client of change	12/12	/	,		
	3.2	Are the practica ☐ SOW	al quanti ☑ QAPI	tation limits the same as tho					Comments:	
NOT	E: Verify	that the reported m	netals mat	ch the target list specified on the	COC.	1 RON	Pac	15	8. Lab	used
6010.d	loc					9-7	Jo a	ction in all	8. Lab required scarples	, I RUN
				P:\Projects\olinwilm\Data V						3 of 10

	N: If no, evaluate variation with respect to sample matrix, preparation, dilution, e, etc. If sample PQL is indeterminate, contact lab for explanation.				
3.3	Are results present for each sample in the SDG?	Yes 🔟	No []	N/A []	Comments:
ACTION:	If no, check Request for Analysis to verify if method was ordered and COC to verify that	it was sent, a	nd contact la	b for resubmi	ission of the missing
3.4	If dilutions were required, were dilution factors reported?	Yes [No []	N/A []	Comments:
ACTION:	If no, contact the lab for submission.				
4.0 <u>M</u>	ethod Blanks				
4.	Is the Method Blank Summary present?	Yes 🔟	No [_]	N/A []	Comments:
ACTIO	N: If no, call the laboratory for submission of missing data.				
4.3	Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples?	Yes 🗹	No []	N/A []	Comments:
	N: If no, contact laboratory for justification. Consult senior chemist for action Narrate non-compliance.				
4.	Is the method blank less than the PQLs for all target elements?	Yes [No[]	N/A []	Comments:
NOTE: samples	MADEP requires the method blank to be matrix matched and digested with the	165	110		Comments.
4.4 the	4 Do any method blanks have positive results for metals? Qualify data according to e following:	res [V]		N/A []	Comments:
6010 doc		1	por -	3.78	ng/1cg => 5
au Lu doc					

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

agging level (flagging level A

		or any blank with positive results, list all contaminants for each method blank value) and the associated samples and qualifiers.	including	the concen	tration detec	ted and the fla
5.0	Labo	ratory Control Standard				
	5.1	Was a laboratory control standard run with each analytical batch of 20 samples or less?	Yes [V	No [_]	N/A []	Comments:
AC	TION:	<u>all</u> target, second source LCS is required by MADEP. Call laboratory for LCS form submittal. If data are not available, use ljudgement to evaluate data accuracy associated with that batch.				·
	5.2	Is a LCS Summary Form present?	Yes 🗹	No [_]	N/A []	Comments:
AC	TION:	If no, contact lab for resubmission of missing data.				
with non-	Water Soil FION: in the laterts	Is the recovery of any analyte outside of MADEP control limits? MADEP de Type	Yes []	No [1]	N/A [_]	Comments:
						Comments:

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6.0 **Matrix Spikes**

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-SD-SD5

Were project-specific MS/MSDs collected? List project samples that were 6.1

Yes Mo No No NA Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [No [] N/A [] Comments:

NOTE: A full target, second source MS/MSD is required by MADEP.

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes [No [] N/A [] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the OC limits? Yes No No N/A Comments:

	MADEP	QAPP	
Sample Type	% Rec	% Rec	Method
Water	75-125	N/A	6010B
Water	N/A	70-130	200.7
Soil	75-125	75-125	6010B

| N/A | 6010B | N/A | 6010B | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D | M S D |

NOTE:
$$%R = (SSR-SR) \times 100\%$$

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits?

Yes No No NA Comments:

NOTE: RPD = S-D x 100% (S+D)/2

Where: S = MS sample result D = MSD sample result

Aluminum - 44

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory **Yes** [] No [] N/A [] Comments: Duplicate Sample Form present?

NOTE: MADEP refers to this sample as a "matrix duplicate".

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits?

Yes No No N/A Comments

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MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > $5 \times$ RL, RPD must be $\pm 20\%$	20
For aqueous results $< 5 \times RL$, RPD must be $\leq RL$	20
For soil/sediment results > $5 \times$ RL, RPD must be $\pm 35\%$	20
For soil/sediment results $< 5 \times RL$, RPD must be $\leq 2 \times RL$	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

Yes No N/A N/A Comments

Yes No N/A N/A N/A Comments

NOTE: MADEP does not require the collection of rinsate blanks.

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is $> 5 \times$ blank value, no qualification is needed.

9.0 <u>Field Duplicates</u>

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9.2 Were field duplicates collected per the required frequency?	Yes 🗹	No []	N/A []	Comments:						
SOW ☐ QAPP (1 per 10) ☐ MADEP Option 1 (1 per 20) ☐ MADEP Option 3 (1 per 10) ☐										
9.3 Was the RPD \leq 50% for soils or waters? Calculate the RPD for all results and attach to this review.	Yes 🚺	No []	N/A []	Comments:						
CTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.										
0.0 Special QA/QC										
10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal.	Yes []	No 🗹	N/A [_]	Comments:						
ACTION: If results for both total and dissolved are $\geq 5x$ the PQL and the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than $5x$ the PQL and the difference exceeds $2x$ the PQL, flag both results as estimated (J)										

10.0	Application of Validation Qualifiers				
	Was any of the data qualified?	Yes 🗾	No [N/A []	Comments
If so, ap	oply data qualifiers directly to the DQE copy of laboratory report and flag pages for entry in	database.			

REFERENCES

- LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999
- U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.
- MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

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QC Sample Results

Client: Olin Corporation

Project/Site: Olin Chemical Wilmington MA Superfund S

TestAmerica Job ID: 480-28730-1

Method: 6010 - Metals (ICP)

Lab Sample ID: MB 480-92192/1-A

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 92192

	11110 11110						
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND	0.49	0.19 mg/Kg		11/21/12 10:20	11/21/12 21:03	1
Aluminum	ND	9.7	4.3 mg/Kg		11/21/12 10:20	11/21/12 21:03	1
Iron	3.78 J	9.7	1.1 mg/Kg		11/21/12 10:20	11/21/12 21:03	1

MR MR

Lab Sample ID: LCDSRM 480-92192/3-A LCDSRM

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 92192

Spike LCDSRM LCDSRM Analyte Added Result Qualifier Unit %Rec Limits RPD Limit Chromium 351 113 32.1 mg/Kg 23.6 - 43.9 2 20 Aluminum 7640 68200 mg/Kg 11.2 5.9 - 21.4 3 20 Iron 42900 11100 mg/Kg 25.9 9.8 - 50.8 20

Lab Sample ID: LCSSRM 480-92192/2-A

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 92192

	Spike	LCSSRM	LCSSRM				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Chromium	351	115		mg/Kg		32.6	23.6 - 43.9	
Aluminum	68100	7900		mg/Kg		11.6	5.9 - 21.4	
Iron	42900	11100		mg/Kg		26.0	9.8 - 50.8	

Lab Sample ID: 480-28730-5 MS

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: OC-SD-SD5

Prep Type: Total/NA

Prep Batch: 92192

		Sample	Sample	Spike	MS	MS				%Rec.	
	Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
-	Chromium	UX 460		59.8	505	4	mg/Kg	<u></u>	- 69	75 - 125	
	Aluminum	11000		2990	15100	F	mg/Kg	☆	148	75 - 125	
	Iron	14000	В	2990	15900	4	mg/Kg	₩	55_	75 - 125	
١		(X)									

Lab Sample ID: 480-28730-5 MSD

Matrix: Solid

Analysis Batch: 92420

Client Sample ID: OC-SD-SD5

Prep Type: Total/NA

Pren Batch: 92192

ı	Analysis Daton. JE420										rie	p batch. 9	2192
-		S	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
	Analyte	. /	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
i	Chromium	X	460		56.8	321	4 F	mg/Kg	*	-252	7 5 ₋ 125	45	35
	Aluminum	(,	11000		2840	9650	F	mg/Kg	⇔	-36	75 - 125	44	35
-	Iron	111	14000	В	2840	10900	4 F	mg/Kg	≎	117	75 - 125	37	35
		- / Y											

12/12/12







Field Duplicate

lab_sample_id	field_sample_id	qc_code	param_name	final_result	average	difference	RPD
480-28730-5	OC-SD-SD5	FS	Aluminum	11000	10400	1200	12%
480-28730-6	OC-SD-SD5-DUP	FD	Aluminum	9800			
480-28730-5	OC-SD-SD5	FS	Chromium	460	455	10	2%
480-28730-6	OC-SD-SD5-DUP	FD	Chromium	450			
480-28730-5	OC-SD-SD5	FS	Iron	14000	12500	3000	24%
480-28730-6	OC-SD-SD5-DUP	FD	Iron	11000			

Version 3, October 2008
Clorize, Sulfate
Ammonia, Consultivity

OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Reviewer/Date Mile WastBurn 12/12/12
Sr. Review/Date Chr. 5 Record 1/18/13
Lab Report # 490-28600-1
Project # 6107120016

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

	not define criteria, QA/QC requirements will default to limits employed by the laboratory.									
1.0	Laboratory Deliverable Re	equirements								
	1.1 Laboratory Informati Check items received.	on: Was all of the	following provided	in the laboratory report?	Yes 🔄	No []	N/A []	Comments:		
	☐ Name of Laboratory	☐ Address	☑ Project ID	☐ Phone #	☐ Sample	identificatio	n – Field and i	Laboratory		
	Name of Laboratory Client Information:	□ Name	□ Address	☐ Client Contact	(IDs must be	cross-refer	enced)			
ACTIO	ON: If no, contact lab for									
	1.2 Laboratory Report	t Certification Sta	tement		Yes [No []	N/A []	Comments:		
	Does the laboratory repo	ort include a compl	eted Analytical Re	port Certification in the r	equired form	at?				
ACTIO	N: If no, contact lab for su	ıbmission of missir	ng certification or c	ertification with correct t	format.					
	1.3 Laboratory Case N	larrative:			Yes [No []	N/A []	Comments:		
	☐ Narrative serves as a	n exception report fo	r the project and me	thod QA/QC performance	ce. D'Narrative includes an explanation of each discrepancy on the Certification Statement.					
ACTIO	N: If no, contact lab for su	ubmission of missir	ng or illegible inforr	mation.						
	1.4 Chain of Custody (C	COC) copy present w	rith all documentatio	n completed?	Yes 🗹	No []	N/A []	Comments:		
	Does the laboratory report	include copies of Ch	ain of Custody form	s containing all samples in	this SDG?					
	NOTE: Olin receives and r	maintains the <i>origina</i>	al COC.							
ACTIC	N: If no, contact lab for sub	omission of copy of r	nissing completed C	OC.						
	1.5 Sample Receipt Infortasks completed and record	rmation (Cooler R led upon receipt of the	eceipt Form): We ne sample(s) into the	ere each of the following laboratory?	Yes 🔛	No []	N/A []	Comments:		

Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered o	on the same day	as collection	on, temperatur	e requirement does not apply).
Container type noted Condition observed PpH verified (where applicable) Field and lab II	Os cross referer	nced		
ACTION: If no, contact lab for submission of missing or incomplete documentation. 1.5.1 Were the correct bottles and preservatives used? Ammonia,— 1 Liter polyethylene/H ₂ SO ₄ to pH<2,cool to 4°C	Yes 🗹	No []	N/A []	Comments:
Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C Alkalinity – 1 Liter polyethylene/cool to 4°C				
Chemical Oxygen Demand – 50 mL polyethylene/H ₂ SO ₄ to pH<2,cool to 4°C Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C				
Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C Organic Carbon – 500 mL amber glass bottle/HCl or H ₂ SO ₄ to pH<2,cool to 4°C Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C				
Phenolics - H ₂ SO ₄ to pH<2,cool to 4°C Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C				
ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment				
1.5.2 Were all samples delivered to the laboratory without breakage?	Yes 📋	No []	N/A []	Comments:
1.5.3 Does the Cooler Receipt Form or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?	Yes []	No 🇹	N/A []	Comments:
1.6 Sample Results Section: Was the following information supplied in the laboratory report for each sample?	Yes 🔛	No [_]	N/A []	Comments:

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OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST

WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Field ID and Lab ID Clean-up method	☐ Date and time collected ☐ Analysis method	☐ Analyst Initials ☐ Preparation method	Dilution Factor
☐ Matrix	☐ Target analytes and concentra	tions	☐ Units (soils must be reported in dry weight)
ACTION: If no, contact l	ab for submission of missing or inco	mplete information.	
1.7 QA/QC Information for each sample be	rmation: Was the following informatch?	ation provided in the laborat	fory report Yes No No N/A Comments:
Method blank results	□ LCS recoveries □ MS/MSD	recoveries and RPDs 🗹	aboratory duplicate results (where applicable)
ACTION: If no, contact la	b for submission of missing or incom	mplete information.	
2.0 <u>Holding Times</u>			Yes No No N/A Comments:
Have any technic	al holding times, determined from o	date of collection to date of	analysis, been exceeded? The holding times are as follows:
28 days = a	mmonia, chemical oxygen demand,	chloride, organic carbon, o	il & grease, specific conductance, total organic carbon and sulfate
Alkalinity =	= 14 days Sulfide	TDS, TSS = 7 days	pH = analyze immediately Nitrate nitrogen as $N = 48 hrs$
Nitrite nitro	gen as N = 48 hrs Nitrate	+ Nitrite as $N = 28$ days	
NOTE: List samp	oles that exceed hold time with # of o	lays exceeded on checklist	
ACTION: If technical he judgment used to qualify so		esults (J). For water sample	es that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional
3.0 Laborato	ory Method		Yes No No N/A Comments:
3.1 Was the corre	ct laboratory method used?		
ACTION: If no, contact la	b to provide justification for method	change compared to the req	uested method. Contact senior chemist to inform Client of change or to request variance.
3.2 Are the ☐ QAPP/	practical quantitation limits the IRSWP □ Lab?	same as those specified	d by the Yes No No N/A Comments:
Note: The MADE	EP QA/QC Guidelines do not yet l	ist PQLs for wet chemistry	analyses,

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LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST

WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

	therefore all criteria will default to values a define criteria, QA/QC requirements definay also apply.			
	Ammonia* ⊠= 0.1 mg/ L	Alkalinity** $\square = 1 \text{ mg/L}$	Bicarbonate Alkalinity** □ = 1 mg/L	Carbonate Alkalinity** $\square = 1 \text{ mg/L}$
	Nitrate Nitrogen as $N* \square = .05 \text{ mg/L}$	Nitrite Nitrogen as N* \square = .01 mg/I	Chloride* $\Box = 1 \text{ mg/L}$	Hardness $*\Box = 2 \text{ mg/L}$
	Spec. Cond.** ☑ 3 umhos/cm	Total Organic Carbon** □ = 1 mg/I	Oil & Grease* $\square = 5.5 \text{ mg/L}$	Sulfate (EPA 300.0)* ☐ = 2 mg/L
	COD:* Low – 20 mg/L	COD* High - 50 mg/L □	$TDS* \square = 10 \text{ mg/L}$	$TSS* \square = 5 \text{ mg/L}$
	pH* \square < 2 to > 12	Phenolic - 0.01 mg/L		
	Other parameter(list)	PQL = [Source of PQL =	<u> </u>
	Other parameter(list)	PQL=	Source of PQL =	
ACTIO			sture, etc. If sample PQL is indeterminate, contact	
	3.3 Are the appropriate parameter results ON: If no, check Request for Analysis to ve 3.4 If dilutions were required, were dilution ON: If no, contact the lab for submission.	rify if method was ordered and COC to v	Yes No No N/A Serify that it was sent, and contact lab for resubmiss	Comments: sion of the missing data Comments:
4.0	Method Blanks		Yes Mo No N/A	Comments:
	4.1 Are the Method Blank Summaries pro	esent?		
ACTIO	ON: If no, call the laboratory for submissio	n of missing data.		
	4.2 Was a method blank analyzed for ea 20 or less?	ch analysis batch of wet chemistry field s	amples of Yes No No N/A	Comments:
ACTIO	ON: If no, document discrepancy in case na	arrative and contact lab for justification.	Consult senior chemist for action needed.	

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	4.3 Is th	e method blank less than the PQL? (See Section 3.2 for PQLs).	Yes 🖳	No []	N/A []	Comments:
		any method blanks have positive results for wet chemistry parameters? Qualify data ag to the following:	Yes []	No [V	N/A []	Comments:
		mple concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the the concentration reported if greater than the PQL.				•
	If the sa	mple concentration is $> 5 \times$ blank value, no qualification is needed.				
ACTI qualifie		ry blank has positive results, list all the concentrations detected and flagging level (fla	ngging level =	= 5 × blank v	value) on the c	hecklist. List all affected samples and their
5.0	<u>Labora</u>	tory Control Standards		,		
	5.1	Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less?	Yes 🗸	No []	N/A []	Comments:
		o, call laboratory for LCS form submittal. If data is not available, use professional rmine qualification actions for data associated with the batch.				
	5.2	Is a LCS Summary Form present?	Yes 🗾	No []	N/A []	Comments:
ACTIO	ON: If no	contact lab for resubmission of missing data.				
	5.3	Is any wet chemistry analyte LCS recovery outside the control limits?	Yes []	No 🗹	N/A []	Comments:

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LCS Limits:

,	Alkalinity** $\square = 80\text{-}120\%$ Total Organic Carbon** $\square = 80\text{-}120\%$ COD Low* $\square = 80\text{-}120\%$ Hardness* $\square = 80\text{-}120\%$	Bicarbonate Alkalinity** $\square = 80-120\%$ TDS** $\square = 80-120\%$ COD High* $\square = 80-120\%$ Chloride* $\square = 80-120\%$	Oil & Grease* □ Nitrate Nitroge	rbonate Alkalinity** $\square = 80\text{-}120\%$ il & Grease* $\square = 80\text{-}120\%$ itrate Nitrogen as N** $\square = 80\text{-}120\%$ ulfate (EPA 300.0)* $\square = 80\text{-}120\%$		Specific Conductivity *I Ammonia Nitrogen as I Nitrite Nitrogen as N pH* □ = 98-102%	N* □ = 80-120%
	Other parameter(list)	%R =		☐ Rec Li	mits=		
	Other parameter(list)	%R =		□ Rec Li	mits =		
		(MADEP has not yet defined LCS recov	ery limits for wet o	hemistry and	alyses.)		
	ACTION : If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).						
6.0	Matrix Spikes						
	_	requencies based on monthly, quarterly, ents for each set with the senior chemist.			0 C- GW		
ACTION	V: If no, contact senior chemist to see if a	s analyzed? List project samples that were spany were specified.	oiked. Yes [<u>\</u>	No [_]	0 C- Gw 0 C- PZ - N/A []	Comments:	
	6.2 Is the MS/MSD Recovery Form I: If no, contact lab for resubmission of	•	Yes 🗹	No [_]	N/A []	Comments:	
	6.3 Were matrix spikes analyzed matrix?	at the required frequency of 1 per 20 samp		No []	N/A []	Comments:	
ACTION	N: If any matrix spike data is missing, ca	all lab for resubmission.					
	6.4 Are any wet chemistry analyte	spike recoveries outside of the QC limits?	Yes []	No 🗹	N/A []	Comments:	

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LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST

WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

	NOTE:	%R = g	(SSR-SR) x 1	00%		When	e: '	SSR =	= Spiked SR	sample = Sample	resul resul
			S	A = Spike added						-	
	MS/MSD Recovery Li	imits:									
	Alkalinity* = NA	,	Bicarbonate Al	kalinity* = NA	Carbonate alkalinity*	= NA	Ammoni	a* (LACI	HAT) 🗹 = 75	5-125%	
	Chloride*(SM 4500 Cl)) 🗹 = 75-125%	Specific Condu	ctivity * = NA	Total Organic Carbo	$n^* = NA$	TDS** =	= NA			
	Oil & Grease* = NA		COD Low* □	= 75-125%	COD High* □ = 75-	125%	Nitrate N	itrogen as	s N** □ = 75	5-125%	
	Nitrite Nitrogen as N**	[‡] □ = 75-125%	Hardness* □ =	= 75-125%	Sulfate (EPA 300.0)*	* 🖳 75-125%	$pH^* = N$	IA .	TSS* =	= NA	
	Other parameter(list) _			R =		_ □ Rec Lim	nits =				
	* = Laboratory Limits	** =	Olin QAPP Limits	(MADEP has no	t yet defined LCS reco	overy limits for	wet chem	istry ana	alyses.)		
	NOTES: 1) If only one 2) If the MS/I				ntrol limits, no qualifica		v. Use prof	fessional j	judgment for	the MS/MSI	O flags.
qualify p	N: MS/MSD flags only positive results as estima D recovery is < 30% and	ted (J). If the real the sample is not	coveries of the MS a n-detect, the results a	nd MSD are lower the considered unusab	nan the lower control lingle and flagged (R).	mit but > 30%, o	qualify both	h positive	e results and r	non-detects (J). If the
	N: Laboratory control led, but no flags are applied		i spiked sample resul	is fair within the nor	mai canbration range. I	i diludons are re	equired due	e to mgn	sample conce	entrations, in	e data 1
	6.5 Are any RPDs for N	MS/MSD recover	ies outside of the QA	/QC limits?							
	NOTE : RPD = $S - I$ (S + D)		Where $S = MS$ result $D = MSD$ resu	ılt	Yes []	No Y	√A []	Commo	ents:		
	MS/MSD RPD Limits	<u>:</u>									
	RPD ≤20										
7.0	Laboratory Duplicate	<u>}</u>									
	Are the RPDs for the la	aboratory duplica	ates <20% unless oth	nerwise specified bel	ow? Yes	No [_] N	V/A []	Comme	ents:		

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ACTIO	ON : If the RPD is gre	ater than specified limits, qualify all results for that	analyte as estimated (J)				
	pH* □ = 3%	Specific Conductivity *□=5%	TSS** □ = 6%		7	ΓDS** □ = 6%	6
8.0	Sampling Accurac	Y					
		rater samples are collected directly from a tapinse blanks will not be collected.	o, process stream, or				
		lanks collected? Prior to evaluating rinsate blank from the senior chemist.	ss, obtain a list of the	Yes []	No LY	N/A []	Comments:
	8.2 Do any rinsate b	planks have positive results?		Yes []	No [_]	N/A	Comments:
ACTI	ON: Evaluate rinsa	te results vs. blank results to determine if cont	aminant may be labor	ratory-deriv	ed. If not l	ab-related, qu	ualify according to the table below.
		entration is < 5 × blank value, flag sample result no	•	•		, .	,
	If the sample conce	entration is > 5 × blank value, no qualification is ne	eded.				
NOTE	: MADEP does not	require the collection of rinsate blanks.					
9.0	Field Duplicates						
	9.1 Were field d	duplicate samples collected? Obtain a list of samples.	es and their associated	Yes 🗹	No []	N/A []	Comments:
	9.2 Were field dup	licates collected per the required frequency?		Yes 🔟	No []	N/A []	Comments:
QA	.PP/IRSWP □ MA	ADEP Option 1(1 per 20) MADEP Option	n 3 (1 per 10) □				
	9.3 Was the RPD ≤ attach to this revi	30% for waters \leq 50% for soils? Calculate the lew.	RPD for results and	Yes 🗹	No [_]	N/A []	Comments:

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ACTION:. Qualify data (J) for both sample results if the RPD exceeded.				•
Was any of the data qualified?	Yes []	No LY	N/A [_]	Comments:
If so, apply data qualifiers directly to the DQE copy of laboratory report and flag pages for entry in database.				

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

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Freid Deplicate

field_sample_id	qc_code	param_name	final_result	average	difference RPD	
OC-DUP-202D	FD	Chloride	180	175	10	6%
OC-GW-202D	FS	Chloride	170			
OC-DUP-202D	FD	LAB SPECIFIC CONDUCTANCE	2400	2400	0	0%
OC-GW-202D	FS	LAB SPECIFIC CONDUCTANCE	2400			
OC-DUP-202D	FD	Nitrogen, as Ammonia	120	130	20	15%
OC-GW-202D	FS	Nitrogen, as Ammonia	140			
OC-DUP-202D	FD	Sulfate	880	870	20	2%
OC-GW-202D	FS	Sulfate	860			

Version 3, October 2008 chilority, Sulfate ammonia, consuctivity

OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Reviewer/Date M. Ke Wastrough		121	12
Sr. Review/Date Chus Ricards	1/	18	113
Lab Report # 480-23687			
Project # 6107120016		1	_

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0	Laboratory Deliverable Requirer	<u>ements</u>							
	1.1 Laboratory Information : Wa Check items received.	as all of the following provided in	the laboratory report?	Yes 🗹	No []	N/A []	Comments:		
	☐ Name of Laboratory ☐	Address	Phone #	☐ Sample	identification	– Field and L	aboratory		
	Client Information:	Name	Client Contact	(IDs must be	cross-refere	enced)			
ACTIO	N: If no, contact lab for submis	ission of missing or illegible info	ormation.						
	1.2 Laboratory Report Certif			Yes 🗹		N/A []	Comments:		
	Does the laboratory report include a completed Analytical Report Certification in the required format?								
ACTIO	ACTION: If no, contact lab for submission of missing certification or certification with correct format.								
	1.3 Laboratory Case Narrative: Yes [
	☐ Narrative serves as an excep	ption report for the project and meth	nod QA/QC performance.		rative include cation Stater		ion of each discrepancy on the		
ACTIO	N: If no, contact lab for submissi	sion of missing or illegible informa	ation.						
	1.4 Chain of Custody (COC) co	opy present with all documentation	completed?	Yes 💆	No []	N/A []	Comments:		
	Does the laboratory report include	e copies of Chain of Custody forms	containing all samples in	this SDG?					
	NOTE: Olin receives and maintain	ins the <i>original</i> COC.							
ACTIO	N: If no, contact lab for submission	n of copy of missing completed CO	C.						
		n (Cooler Receipt Form): Were on receipt of the sample(s) into the la		Yes 🗾	No []	N/A []	Comments:		

\square Sample temperature confirmed: must be $1^{\circ} - 10^{\circ}$ C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).								
☐ Container type noted ☐ Condition observed ☐ pH verified (where applicable) ☐ Field and lab IDs cross referenced								
ACTION: If no, contact lab for submission of missing or incomplete documentation.								
1.5.1 Were the correct bottles and preservatives used?								
Ammonia,- 1 Liter polyethylene/H ₂ SO ₄ to pH<2,cool to 4°C	Yes []	No []	N/A []	Comments:				
Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C								
Alkalinity – 1 Liter polyethylene/cool to 4°C								
Chemical Oxygen Demand – 50 mL polyethylene/H ₂ SO ₄ to pH<2,cool to 4°C								
Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C								
Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C	•							
Organic Carbon – 500 mL amber glass bottle/HCl or H ₂ SO ₄ to pH<2,cool to 4°C								
Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C								
Phenolics - H ₂ SO ₄ to pH<2,cool to 4°C								
Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C								
ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment								
1.5.2 Were all samples delivered to the laboratory without breakage?	Yes 🔟	No [_]	N/A []	Comments:				
1.5.3 Does the Cooler Receipt Form or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?	Yes [_]	No 🔟	N/A [_]	Comments:				
1.6 Sample Results Section: Was the following information supplied in the laboratory report for each sample?	Yes 📋	No []	N/A [_]	Comments:				
 ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment 1.5.2 Were all samples delivered to the laboratory without breakage? 1.5.3 Does the Cooler Receipt Form or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? 1.6 Sample Results Section: Was the following information supplied in the laboratory 	Yes [No 🔟	N/A []	Comments:				

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OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST

WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Field ID and La Clean-up method		collected	Dilution Factor Date of preparation/extractio	% moisture or solids n/digestion clean-up and analysis, w	Reporting limits
☐ Matrix	☐ Target analytes a	nd concentrations	☐ Units (soils must be reported	in dry weight)	
ACTION: If no, co	ontact lab for submission of mi	ssing or incomplete information.			
1.7 QA/QO for each sa	C Information: Was the follomple batch?	wing information provided in the labora	atory report Yes No No	N/A [_] Comments:	
Method blank re	sults	MS/MSD recoveries and RPDs	Laboratory duplicate results (where	applicable)	
ACTION: If no, co	ntact lab for submission of mis	ssing or incomplete information.			
2.0 Holding T	imes		Yes No No	N/A] Comments:	
Have any t	echnical holding times, deterr	mined from date of collection to date of	f analysis, been exceeded? The hol	ding times are as follows:	
28 da	ys = ammonia, chemical oxyg	gen demand, chloride, organic carbon,	oil & grease, specific conductance,	total organic carbon and sulfate	
Alka	linity = 14 days	Sulfide, TDS, TSS = 7 days	pH = analyze immediately	Nitrate nitrogen as $N = 48$	hrs
Nitri	te nitrogen as $N = 48 \text{ hrs}$	Nitrate + Nitrite as $N = 28$ days			
NOTE: Li	st samples that exceed hold tim	ne with # of days exceeded on checklist			
ACTION: If techn judgment used to qu		led qualify results (J). For water sample	les that are grossly exceeded (>2X	hold time) reject (R) all non-detect	ct results. Professional
3.0 La	boratory Method		Yes Mo No	N/A [] Comments:	
3.1 Was the	e correct laboratory method us	ed?			
ACTION: If no, con	ntact lab to provide justification	n for method change compared to the rec	quested method. Contact senior cher	mist to inform Client of change or to	request variance.
3.2 Are □ (the practical quantitation QAPP/IRSWP Lab?	limits the same as those specifie	ed by the Yes [No [N/A [] Comments:	
Note: The	MADEP QA/QC Guidelines	do not yet list PQLs for wet chemistry	y analyses,		

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OLIN-WILMINGTON

LEVEL I DATA QUALITY EVALUATION

STANDARD OPERATING PROCEDURE AND CHECKLIST WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

	therefore all criteria will default to values a define criteria, QA/QC requirements definay also apply.								
	Ammonia* □ = 0.1 mg/ L	Alkalinity** $\square = 1 \text{ mg/L}$	Bi	carbonate Alkali	inity** □	= 1 mg/L	Carbonate Alkalinity** $\square = 1 \text{ mg/L}$		
	Nitrate Nitrogen as N* \square = .05 mg/L	Nitrite Nitrogen as $N* \square = .01$ n	ng/L C	Chloride* ☐= 1 mg/L			Hardness $*\Box = 2 \text{ mg/L}$		
	Spec. Cond.** 3 umhos/cm	Total Organic Carbon** □ = 1 r	ng/L C	il & Grease* □	=5.5 mg	/L	Sulfate (EPA 300.0)* □ = 2 r		
	COD:* Low – 20 mg/L	COD* High - 50 mg/L □	\mathbf{T}	DS* □ = 10 mg	g/L		TSS* $\square = 5 \text{ mg/L}$		
	$pH* \square < 2 \text{ to} > 12$	Phenolic - 0.01 mg/L							
	Other parameter(list)	PQL =	_ □ Source	of PQL =					
	Other parameter(list)	PQL =	_ □ Source	of PQL =					
ACTIO	ON: If no, evaluate change with respect to s	ample matrix, preparation, dilution, r	moisture, etc. It	sample POL is	indetermi	nate, contact 1	ab for explanation.		
	3.3 Are the appropriate parameter results ON: If no, check Request for Analysis to ver 3.4 If dilutions were required, were dilution ON: If no, contact the lab for submission.	rify if method was ordered and COC		Yes Massent, and co	ontact lab	for resubmiss	-		
4.0	Method Blanks			Yes 🗹 N	No []	N/A []	Comments:		
	4.1 Are the Method Blank Summaries pre	esent?							
ACTIO	ON: If no, call the laboratory for submission	n of missing data.							
	4.2 Was a method blank analyzed for eac 20 or less?	ch analysis batch of wet chemistry fie	eld samples of	Yes [N	Ňo []	N/A []	Comments:		
ACTIO	ON: If no, document discrepancy in case na	rrative and contact lab for justificatio	on. Consult sen	ior chemist for a	action nee	ded.			

	4.3 Is th	the method blank less than the PQL? (See Section 3.2 for PQLs).	Yes 🗹	No []	N/A []	Comments:
		any method blanks have positive results for wet chemistry parameters? Qualify data ng to the following:	Yes []	No 🗹	N/A []	Comments:
		mple concentration is $< 5 \times$ blank value, flag sample result non-detect "U" at the the concentration reported if greater than the PQL.				
	If the sa	imple concentration is $> 5 \times$ blank value, no qualification is needed.				
ACTI qualifie		ny blank has positive results, list all the concentrations detected and flagging level (fla	gging level =	= 5 × blank v	value) on the c	hecklist. List all affected samples and their
5.0	Labora	tory Control Standards				
	5.1	Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less?	Yes 🗹	No []	N/A []	Comments:
		o, call laboratory for LCS form submittal. If data is not available, use professional rmine qualification actions for data associated with the batch.				
	5.2	Is a LCS Summary Form present?	Yes 🔟	No []	N/A []	Comments:
ACTIO	ON: If no,	, contact lab for resubmission of missing data.				
	5.3	Is any wet chemistry analyte LCS recovery outside the control limits?	Yes []	No 🗹	N/A []	Comments:

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T	CS	T	÷.	nit	
1 .			/ I		ъ.

<u>LCS LIM</u>	uts:						
1	Alkalinity** $\square = 80\text{-}120\%$ Total Organic Carbon** $\square = 80\text{-}120\%$ COD Low* $\square = 80\text{-}120\%$ Hardness* $\square = 80\text{-}120\%$	Bicarbonate Alkalinity** $\square = 80-120\%$ TDS** $\square = 80-120\%$ COD High* $\square = 80-120\%$ Chloride* $\square = 80-120\%$	Carbonate Alkalinit Oil & Grease* Nitrate Nitrogen Sulfate (EPA 300.	= 80-120% as N**□ =	= 80-120%	Specific Conductivity * Ammonia Nitrogen as N Nitrite Nitrogen as N pH* □ = 98-102%	N* 🗹 = 80-120%
(Other parameter(list)	%R =		☐ Rec Li	mits=		
(Other parameter(list)	%R =		☐ Rec Li	mits =		
		(MADEP has not yet defined LCS recov	ery limits for wet ch	emistry ana	alyses.)		
within the	e batch as (J). If LCS recovery is <10%, Matrix Spikes			very is belov	v the lower lin	nit, qualify all positive a	nd no-detect results
-	~	requencies based on monthly, quarterly, ents for each set with the senior chemist.			0°-	5W-Za15	
	Were project-specific MS/MSDs I: If no, contact senior chemist to see if ε	s analyzed? List project samples that were sp my were specified.	oiked. Yes 🗹	No []	N/A []	Comments:	
	Is the MS/MSD Recovery Form It: If no, contact lab for resubmission of	*	Yes 🖂	No []	N/A []	Comments:	
(6.3 Were matrix spikes analyzed matrix?	at the required frequency of 1 per 20 samp	ples per Yes 🗹	No []	N/A []	Comments:	
ACTION	: If any matrix spike data is missing, ca	ll lab for resubmission.					
6	Are any wet chemistry analyte	spike recoveries outside of the QC limits?	Yes [_]	No 🗹	N/A []	Comments:	

,	NOTE:	%R = (1)	SSR-SR) x	100%		Where	e: SSR	=	Spiked	sample = Sample	result
		SA		SA = Spike added					SK	= Sample	result
	MS/MSD Recovery Limit	its:									
	Alkalinity* = NA		Bicarbonate	e Alkalinity* = NA	Carbonate alkalinity	* = NA	Ammonia* (I	LACHAT	Γ) $\square = 75$ -	-125%	
	Chloride*(SM 4500 Cl)	≆ 75-125%	Specific Co	nductivity * = NA	Total Organic Carbo	$on^* = NA$	TDS** = NA	A			
	Oil & Grease* = NA		COD Low*	□ = 75-125%	COD High* $\square = 75$	-125%	Nitrate Nitrog	gen as N*	** = 75	-125%	
	Nitrite Nitrogen as N** □] = 75-125%	Hardness*	□ = 75-125%	Sulfate (EPA 300.0))* □ = 75-125%	$pH^* = NA$		TSS* =	NA	
	Other parameter(list)			% R =							
	* = Laboratory Limits	** =	Olin QAPP Lim	its (MADEP has n	ot yet defined LCS rec	overy limits for	wet chemistry	analyse	es.)		
	NOTES: 1) If only one o 2) If the MS/MS				ontrol limits, no qualificample, no qualification is		v. Use profession	onal judg	ment for t	he MS/MSD	flags.
qualify 1	N: MS/MSD flags only appositive results as estimated D recovery is < 30% and the	d (J). If the rec	overies of the M	S and MSD are lower	than the lower control li						
	N: Laboratory control lim d, but no flags are applied.		spiked sample re	esults fall within the no	rmal calibration range.	If dilutions are re	equired due to l	high sam	ple conce	ntrations, the	data is
	6.5 Are any RPDs for MS	/MSD recoveri	es outside of the	QA/QC limits?							
	NOTE : $RPD = \underline{S-D}$				Yes []	No [_] N	√A [✓] Co	mments:	:		
	(S+D)/2		D = MSD	result			0	114	Pana	D Was	a
	MS/MSD RPD Limits:						M	15.1	Jo MS	Dwes	
	RPD ≤20							4-0	142-6	,	
7.0	<u>Laboratory Duplicate</u>										
	Are the RPDs for the laborated and the laborated are the RPDs for the RPDs for the laborated are the RPDs for the	oratory duplica	tes <20% unless	otherwise specified be	elow? Yes 🗹	No [_] N	J/A [] Co	omments:	:		

ACTI	ON: If the RPD is greater that	an specified limits, qualify all results for tha	t analyte as estimated (J)).							
	pH* □ = 3%	Specific Conductivity *□ = 5%	TSS** □ = 6%		Т	$DS^{**} \square = 6\%$	⁄o				
8.0	Sampling Accuracy										
	<i>z</i> • •	amples are collected directly from a ta anks will not be collected.	p, process stream, or								
	8.1 Were rinsate blanks of associated samples from the	collected? Prior to evaluating rinsate blame senior chemist.	aks, obtain a list of the	Yes [No [Y	N/A [_]	Comments:				
	8.2 Do any rinsate blanks	have positive results?		Yes [_]	No [_]	N/A	Comments:				
ACTI	CTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below. If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL. If the sample concentration is > 5 × blank value, no qualification is needed.										
NOTE	: MADEP does not requir	e the collection of rinsate blanks.									
9.0	Field Duplicates										
	9.1 Were field duplicates.	te samples collected? Obtain a list of samp	les and their associated	Yes [_]	No 📝	N/A []	Comments:				
0/	r	collected per the required frequency? Option 1(1 per 20) MADEP Option	on 3 (1 per 10) [7]	Yes [_]	No [_]	N/A 📝	Comments:				
Q.F	·	For waters < 50% for soils? Calculate the		Yes [_]	No []	N/A	Comments:				

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ACTION :. Qualify data (J) for both sample results if the RPD exceeded.				
Was any of the data qualified?	Yes []	No 🗹	N/A []	Comments:
If so, apply data qualifiers directly to the DQE copy of laboratory report and flag pages for entry in database.				

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

Version 3, October 2008

OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Reviewer/Date Mike Washing	112	112/12
Sr. Review/Date Chris Recards	1/18	1/3
Lab Report # 4 4 0 - 2 8 구 2 8	/ /	
Project # 6107120016		

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for Sampling, Data Evaluation and Reporting Activities." MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

	not define criteria, QA/QC				DEI, CIRCIA	a wiii deladi	i to values sup	ulated in the QAFF. where the			
1.0	Laboratory Deliverable R	<u>equirements</u>									
	1.1 Laboratory Informatic Check items received.	on: Was all of the	following provided	in the laboratory report?	Yes 🗹	No []	N/A []	Comments:			
	☐ Name of Laboratory	☐ Address	□ Project ID	☐ Phone #	☐ Sample	e identificatio	on – Field and	Laboratory			
	Client Information:	□ Name	☐ Address	Client Contact	(IDs must b	e cross-refe	renced)				
ACTIO	N : If no, contact lab for	submission of mis	ssing or illegible in	formation.							
	1.2 Laboratory Report	t Certification Sta	tement		Yes [No [_]	N/A []	Comments:			
	Does the laboratory repo	ort include a compl	eted Analytical Re	port Certification in the r	equired forr	mat?					
ACTIO	ACTION: If no, contact lab for submission of missing certification or certification with correct format.										
	1.3 Laboratory Case N				/	No [_]	N/A []	Comments:			
	Narrative serves as ar	n exception report fo	or the project and me	thod QA/QC performance.	. 🛮 🗸 Na	rrative includ	des an explana	ation of each discrepancy on the			
					Certin	fication State	ement.				
ACTIO	N : If no, contact lab for su	ıbmission of missir	ng or illegible inforr	mation.							
	1.4 Chain of Custody (C	OC) copy present w	rith all documentatio	n completed?	Yes 🗹	No []	N/A []	Comments:			
	Does the laboratory report i	include copies of Ch	ain of Custody form	s containing all samples in	this SDG?						
	NOTE: Olin receives and n	naintains the origina	al COC.								
ACTIO	N: If no, contact lab for sub	mission of copy of n	nissing completed C	OC.							
	1.5 Sample Receipt Informatisks completed and recorder				Yes 🗾	No []	N/A []	Comments:			

☐ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered of	on the same d	lay as collect	ion, temperatu	re requirement does not apply).
☐ Container type noted ☐ Condition observed ☐ pH verified (where applicable) ☐ Field and lab ☐	Ds cross refe	renced		
ACTION: If no, contact lab for submission of missing or incomplete documentation. 1.5.1 Were the correct bottles and preservatives used? Ammonia,— 1 Liter polyethylene/H ₂ SO ₄ to pH<2,cool to 4°C Oil & Grease — 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C Alkalinity — 1 Liter polyethylene/cool to 4°C Chemical Oxygen Demand — 50 mL polyethylene/H ₂ SO ₄ to pH<2,cool to 4°C Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C Organic Carbon — 500 mL amber glass bottle/HCl or H ₂ SO ₄ to pH<2,cool to 4°C	Yes 🗹	No []	N/A []	Comments:
Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C Phenolics - H ₂ SO ₄ to pH<2,cool to 4°C Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment				
 1.5.2 Were all samples delivered to the laboratory without breakage? 1.5.3 Does the Cooler Receipt Form or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? 	Yes Yes	No []	N/A [_]	Comments:
1.6 Sample Results Section: Was the following information supplied in the laboratory report for each sample?	Yes 🗹	No []	N/A [_]	Comments:

Page 2 of 9

Field ID and Lab ID	Date and time collected Analysis method	☐ Analyst Initials ☐ Preparation method	Dilution Factor Date of preparation/extraction	NA □ % moisture or solids on/digestion clean-up and analysis	Reporting limits, where applicable
☐ Matrix	Target analytes and concentr	ations	☐ Units (soils must be reporte	d in dry weight)	
ACTION: If no, contact l	ab for submission of missing or inc	omplete information.			
1.7 QA/QC Infor	rmation: Was the following informatch?	nation provided in the laborat	ory report Yes [No []	N/A [] Comments:	
☑ Method blank results	LCS recoveries MS/MSI	recoveries and RPDs □ L	aboratory duplicate results (where	e applicable)	
ACTION: If no, contact la	ab for submission of missing or inco	omplete information.			
2.0 <u>Holding Times</u>			Yes [No [N/A] Comments: I definition of the comments of the comment	Vitrate/Nitrite
Have any technic	al holding times, determined from	date of collection to date of	analysis, been exceeded? The ho	olding times are as follows:	Surplus 54 53
28 days = ax	mmonia, chemical oxygen demand	l, chloride, organic carbon, o	il & grease, specific conductance	, total organic carbon and sulfate	Reject N. tr
Alkalinity =		e, TDS, TSS = 7 days	pH = analyze immediately	Nitrate nitrogen as N =	48 hrs
Nitrite nitro	gen as N = 48 hrs Nitrate	e + Nitrite as N = 28 days			
NOTE: List samp	ples that exceed hold time with # of	days exceeded on checklist			
ACTION: If technical ho judgment used to qualify so	olding times are exceeded qualify bils.	results (J). For water sample	s that are grossly exceeded (>2X	Thold time) reject (R) all non-de	etect results. Professional
3.0 Laborato	ory Method		Yes Mo No	N/A [] Comments:	
3.1 Was the correct	ct laboratory method used?				
ACTION: If no, contact la	b to provide justification for method	d change compared to the requ	uested method. Contact senior che	emist to inform Client of change or	r to request variance.
3.2 Are the	practical quantitation limits the IRSWP □ Lab?	same as those specified	i by the —	N/A [] Comments:	+ nat
Note: The MADE	EP QA/QC Guidelines do not yet	list PQLs for wet chemistry		te reported a	0.0%
WET CHEM.doc		Page	3 of 9		

OLIN-WILMINGTON LEVEL I DATA QUALITY EVALUATION

STANDARD OPERATING PROCEDURE AND CHECKLIST WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

therefore all criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply. Ammonia* $\Box = 0.1 \text{ mg/ L}$ Alkalinity** $\Box = 1 \text{ mg/L}$ Bicarbonate Alkalinity** $\Box = 1 \text{ mg/L}$ Carbonate Alkalinity** $\Box = 1 \text{ mg/L}$ Nitrite Nitrogen as N* ☑= .01 mg/L Nitrate Nitrogen as $N^* = .05 \text{ mg/L}$ Chloride* $\square = 1 \text{ mg/L}$ Hardness $*\Box = 2 \text{ mg/L}$ Spec. Cond.** 3 umhos/cm Total Organic Carbon** $\square = 1 \text{ mg/L}$ Sulfate (EPA 300.0)* $\square = 2 \text{ mg/L}$ Oil & Grease* $\Box = 5.5 \text{ mg/L}$ COD:* Low -20 mg/LCOD* High - 50 mg/L □ $TDS* \square = 10 \text{ mg/L}$ TSS* $\square = 5 \text{ mg/L}$ $pH* \square < 2 \text{ to} > 12$ Phenolic - 0.01 mg/L Other parameter(list) $PQL = \square$ Source of $PQL = \square$ Other parameter(list) ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation. Yes [, / No [] N/A [] 3.3 Are the appropriate parameter results present for each sample in the SDG? Comments: ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data Yes No No N/A 3.4 If dilutions were required, were dilution factors reported? **ACTION:** If no, contact the lab for submission. Yes [No [] N/A [] 4.0 **Method Blanks** Comments: 4.1 Are the Method Blank Summaries present? **ACTION**: If no, call the laboratory for submission of missing data. 4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of Comments: 20 or less?

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

	4.3 Is th	ne method blank less than the PQL?	(See Section 3.2 for PQLs).	Yes 🗹	No []	N/A []	Comments:
		any method blanks have positive reang to the following:	sults for wet chemistry parameters? Qualify data	Yes []	No Ly	N/A []	Comments:
		ample concentration is $< 5 \times$ blank v the concentration reported if greater	alue, flag sample result non-detect "U" at the r than the PQL.				
	If the sa	ample concentration is $> 5 \times \text{blank v}$	alue, no qualification is needed.				
ACTI qualifi		ny blank has positive results, list all	the concentrations detected and flagging level (f	lagging level	= 5 × blank	value) on the c	checklist. List all affected samples and their
5.0	Labora	ntory Control Standards					
	5.1	Was a laboratory control standar samples or less?	rd (LCS) run with each analytical batch of 20	Yes 🖳	No [_]	N/A []	Comments:
		o, call laboratory for LCS form sub rmine qualification actions for data a	omittal. If data is not available, use professional associated with the batch.	[
	5.2	Is a LCS Summary Form present?		Yes 🔟	No []	N/A []	Comments:
ACTI	ON: If no	, contact lab for resubmission of mis	sing data.				
	5.3	Is any wet chemistry analyte LCS	recovery outside the control limits?	Yes []	No 🗹	N/A []	Comments:

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LCS Limits:

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To CO	kalinity** □ = 80-120% otal Organic Carbon** □ = 80-120% OD Low* □ = 80-120% ardness* □ = 80-120%	Organic Carbon** $\square = 80\text{-}120\%$ TDS** $\square = 80\text{-}120\%$ Oil & Nitrate Code High* $\square = 80\text{-}120\%$				Specific Conductivity *□ Ammonia Nitrogen as N Nitrite Nitrogen as N* pH* □ = 98-102%	* 🖳 = 80-120%					
Ot	ther parameter(list)	%R =		☐ Rec Lin	nits=							
Ot	ther parameter(list)	%R =		☐ Rec Lin	nits =							
	(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)											
ACTION : If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).												
6.0 <u>M</u>	atrix Spikes			00-50	0) ۱۶ - در	3						
	•	requencies based on monthly, quarterly, ents for each set with the senior chemist.		00-50	١٠ ١٥ ١٥ - ور	7						
6.3 ACTION:	Were project-specific MS/MSDs If no, contact senior chemist to see if a	s analyzed? List project samples that were spany were specified.		No []	N/A []	Comments:						
6.2 ACTION:	Is the MS/MSD Recovery Form If no, contact lab for resubmission of	A	Yes 🗹	No []	N/A []	Comments:						
6.3	Were matrix spikes analyzed matrix?	at the required frequency of 1 per 20 same	ples per Yes	No []	N/A []	Comments:						
ACTION:	If any matrix spike data is missing, ca	all lab for resubmission.										
6.4	4 Are any wet chemistry analyte	spike recoveries outside of the QC limits?	Yes []	No 🗹	N/A []	Comments:						

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LEVEL I DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURE AND CHECKLIST WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

	NOTE:	%R SA	=	(SSR-	-SR)		100% $SA = S_{I}$	ike added						Whe	ere:		SSR	=	Spiked SR	sample = Samp	e result ole result
	MS/MSD Recovery L	imits:																			
	Alkalinity* = NA	,			Bicarb	onate A	Alkalinit	y* = NA		Carbon	ate alka	linity*	= NA		A	mmoni	a* (LA	СНАТ	r) 🗹 = 75	-125%	
	Chloride*(SM 4500 Cl	l) ⊠	25%		Specifi	ic Conc	ductivity	*= NA		Total C)rganic	Carbo	$n^* = N$	A	T	DS**	= NA				
	Oil & Grease* = NA		-] = 75-1			COD H	[igh* □	= 75-	125%		Ni	itrate N	litroger	as N*	** 🚅 75	5-125%	
	Nitrite Nitrogen as N**	* □ / = 75-1	25%		Hardn	ess* □	= 75-1	25%		Sulfate	(EPA 3	*(0.00	* 🖳 = '	75-1259	% pl	$H^* = N$	ĪΑ		TSS* =	= NA	
	Other parameter(list) _							%R =	=				_ 🗆	Rec Li	imits =	=					
	* = Laboratory Limits							ADEP has i													
qualify p MS/MSI	NOTES: 1) If only on 2) If the MS/ N: MS/MSD flags only positive results as estimated precovery is < 30% and N: Laboratory control d, but no flags are applied 6.5 Are any RPDs for INOTE: RPD = S-1 (S+1)	MSD was apply to the apply to the ted (J). It is the samp limits applied. MS/MSD is applied. MS/MSD is applied.	perfor he san f the ro- le is no y whe	med b aple sp ecover on-det an spik ries ou	y the label piked. It is soft the ect, the ect sample strike of the ect $S = M$	Do not the MS results ple res	ry on a revaluate and MS are conults fall A/QC li	on-project so if sample co if sample co is if sample co is i	sampl concer r than sable	e, no quantration the low	is > 4X wer con gged (R ation ra	ion is responding the second s	required if the mit but full the dilution	f. recove: > 30%,	ries o , qual requi	f the M ify bot red du	IS and In position	MSD everes	exceed th ults and 1	e upper co 1011-detects	ntrol limit, s (J). If the
	$\frac{\text{MS/MSD RPD Limits}}{\text{RPD}} \le 20$	<u>s:</u>																			
7.0	Laboratory Duplicate	2																			
	Are the RPDs for the l	aboratory	duplio	cates <	20% u	nless o	therwise	e specified b	pelow	?	Yes		No [J	N/A	ک	Com	ments:			

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ACTIO	DN : If the RPD is greater the	an specified limits, qualify all results for that	analyte as estimated (J)				
	pH* □ = 3%	Specific Conductivity $\square = 5\%$	$TSS** \square = 6\%$		J	$TDS^{**} \square = 6\%$	6
8.0	Sampling Accuracy						
		amples are collected directly from a taplanks will not be collected.	o, process stream, or				
	8.1 Were rinsate blanks of associated samples from the	collected? Prior to evaluating rinsate blanche senior chemist.	ks, obtain a list of the	Yes [No [N/A []	Comments:
	8.2 Do any rinsate blanks	have positive results?		Yes []	No [_]	N/A	Comments:
ACTI	ON: Evaluate rinsate resu	ults vs. blank results to determine if con-	aminant may be labor	atorv-deriv	ed. If not la	ab-related. aı	ualify according to the table below
		on is < 5 × blank value, flag sample result no				=	
	If the sample concentration	on is $> 5 \times$ blank value, no qualification is no	eded.				
NOTE.	MADEP does not requir	re the collection of rinsate blanks.					
9.0	Field Duplicates						
	9.1 Were field duplication field duplicates.	te samples collected? Obtain a list of sampl	es and their associated	Yes 🗹	No []	N/A []	Comments:
		collected per the required frequency?		Yes 🗹	No []	N/A []	Comments:
QA	PP/IRSWP 🗹 MADEP	Option 1(1 per 20) MADEP Option	n 3 (1 per 10) □				
	9.3 Was the RPD \leq 30% attach to this review.	for waters < 50% for soils? Calculate the	RPD for results and	Yes 🔽	No [_]	N/A []	Comments:

ACTION:. Qualify data (J) for both sample results if the RPD exceeded.	4			
Was any of the data qualified?	Yes [V	No [_]	N/A []	Comments:
If so, apply data qualifiers directly to the DQE copy of laboratory report and flag pages for entry in database.				

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

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Field Duplicate

lab_sample_id	field_sample_id	qc_code	param_name	final_result	Average	Difference	RPD
480-28728-7	OC-SW-SD-17	FS	Chloride	170	170	0	0%
480-28728-8	OC-SW-SD-17-DUP	FD	Chloride	170			
480-28728-7	OC-SW-SD-17	FS	LAB SPECIFIC	1500	1500	0	0%
480-28728-8	OC-SW-SD-17-DUP	FD	LAB SPECIFIC	1500			
480-28728-7	OC-SW-SD-17	FS	Nitrate as N	0.6	0.605	0.01	2%
480-28728-8	OC-SW-SD-17-DUP	FD	Nitrate as N	0.61			
480-28728-7	OC-SW-SD-17	FS	Nitrogen, as Ar	61	60.5	1	2%
480-28728-8	OC-SW-SD-17-DUP	FD	Nitrogen, as Ar	60			
480-28728-7	OC-SW-SD-17	FS	Sulfate	350	350	0	0%
480-28728-8	OC-SW-SD-17-DUP	FD	Sulfate	350			

ms (2/12/12